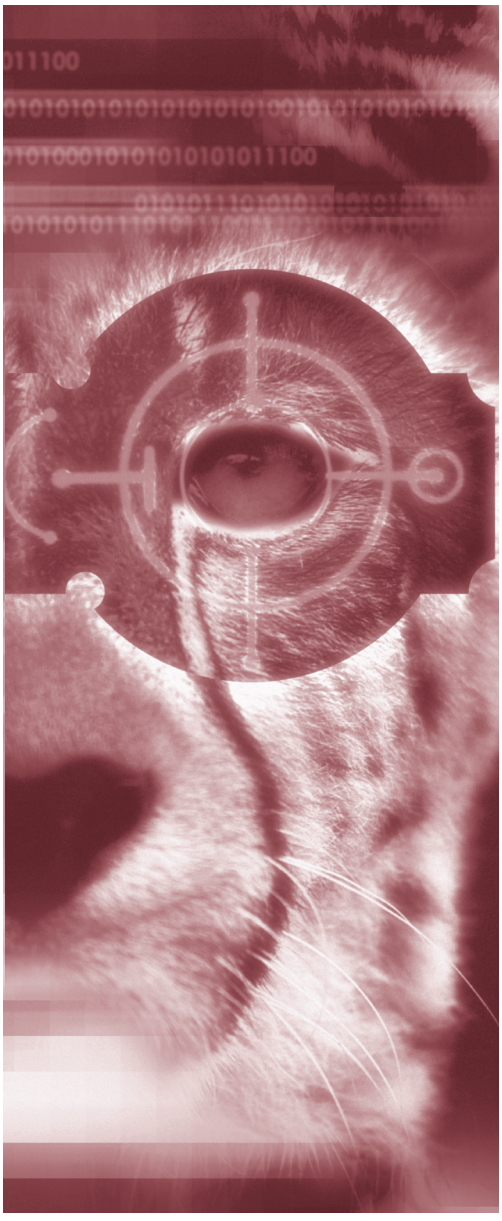
# ADVANCE TECHNICAL PROGRAM



*IS&T/SPIE's 15th Annual Symposium*

# Electronic Imaging

## Science and Technology

**20–24 January 2003**
Santa Clara Convention Center and Westin Hotel
Santa Clara, California USA

**Conferences • Courses • Exhibition**

*Symposium Chairs:*
**John D. Meyer,** Hewlett-Packard Co.
**Robert A. Sprague,** Gyricon Media Inc.

*Symposium Organizing Committee:*
**Jean-Marc R. Fournier,** The Rowland Institute for Science
**John O. Merritt,** The Merritt Group

**New for 2003: a stand-alone event for the Imaging Community.**

SPIE Society of Photo-Optical Instrumentation Engineers
P.O. Box 10
Bellingham, WA 98227-0010 USA

**DATED MATERIAL**

Non-Profit Org.
U.S. Postage Paid
Society of
Photo-Optical
Instrumentation
Engineers

*IS&T/SPIE's 15th Annual Symposium*

# Electronic Imaging

## Science and Technology

**20–24 January 2003**
Santa Clara Convention Center and Westin Hotel
Santa Clara, California USA

**Conferences • Courses • Exhibition**

*Symposium Chairs:*
**John D. Meyer,** Hewlett-Packard Co.
**Robert A. Sprague,** Gyricon Media Inc.

*Symposium Organizing Committee:*
**Jean-Marc R. Fournier,** The Rowland Institute for Science
**John O. Merritt,** The Merritt Group

**2D Display Technologies**

**3D Display and Holography**

**Image and Document Visualization**

**Imaging for Inspection and Metrology**

**Image Processing**

**Digital Image Sensors**

**Multimedia Processing and Applications**

*Sponsored by:*
IS&T The Society for Imaging Science and Technology
SPIE The International Society for Optical Engineering

**Register by 20 December 2002 and save US$100!**

**Reserve your hotel space early!**
*See page 68.*

# Table of Contents

**Daily Schedules** ..... **2-3**
**Plenary Speakers** ..... **4**
**Special Events** ..... **5**

**Technical Conferences**

**2D Display Technologies**
Conf. 5002: Projection Displays IX ..... 6
Conf. 5003: Liquid Crystal Materials, Devices, and Applications IX ..... 7
Conf. 5004: Poly-Silicon Thin Film Transistor Technology and Applications in Displays and other Novel Technology Areas ..... 9

**3D Displays and Holography**
Conf. 5005A: Practical Holography XVII ..... 11
Conf. 5005B: Holographic Materials IX ..... 13
Conf. 5006A: Stereoscopic Displays and Applications XIV ..... 14
Conf. 5006B: The Engineering Reality of Virtual Reality 2003 ..... 17

**Image and Document Visualization**
Conf. 5007: Human Vision and Electronic Imaging VIII ..... 18
Conf. 5008: Color Imaging: Processing, Hardcopy, and Applications VIII 20
Conf. 5009: Visualization and Data Analysis 2003 ..... 22
Conf. 5010: Document Recognition and Retrieval X ..... 24

**Imaging for Inspection and Metrology**
Conf. 5011: Machine Vision Applications in Industrial Inspection XI .... 26
Conf. 5013: Videometrics VII ..... 29

**Image Processing**
Conf. 5012: Real-Time Imaging VII ..... 28
Conf. 5014: Image Processing: Algorithms and Systems II ..... 31
Conf. 5015: Applications of Artificial Neural Networks in Image Processing VIII ..... 33
Conf. 5016: Computational Imaging ..... 34

**Digital Image Sensors**
Conf. 5017A: Sensors, Cameras, and Systems for Scientific/Industrial Applications V ..... 35
Conf. 5017B: Sensors, Cameras, and Applications for Digital Photography Applications V ..... 36

**Multimedia Processing and Applications**
Conf. 5018: Internet Imaging IV ..... 37
Conf. 5019: Multimedia Computing and Networking 2003 ..... 39
Conf. 5020: Security and Watermarking of Multimedia Contents V ..... 40
Conf. 5021: Storage and Retrieval for Media Databases 2003 ..... 43
Conf. 5022: Image and Video Communications and Processing 2003 ... 45

**Short Courses** ..... **50-62**
**The Exhibition** ..... **63**
**General Information** ..... **64-65**
**Travel Information** ..... **66-67**
**Hotel Reservation Form** ..... **68**
***Proceedings*** ..... **69**
**Registration Form** ..... **71**
**Membership Information** ..... **72**

# Daily Conference Schedule

| Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|
| **2D Display Technologies** | | | |
| | Conf. 5002: **Projection Displays IX** (Wu) p.6 | | |
| Conf. 5003: **Liquid Crystal Materials, Devices, and Applications IX** (Chien) p. 7 | | | |
| Conf. 5004: **Poly-Si TFT Technology and Applications in Displays and other Novel Technology Areas** (Voutsas) p. 9 | | | |
| **3D Displays and Holography** | | | |
| Conf. 5005B: **Holographic Materials IX** (Stevenson) p. 13 | Conf. 5005A: **Practical Holography XVII** (Jeong) p.11 | | Conf. 5006B: **The Engineering Reality of Virtual Reality 2003** (Bolas) p. 17 |
| Conf. 5006A: **Stereoscopic Displays and Applications XIV** (Woods, Merritt, Benton) p. 14 | | | |
| **Image and Document Visualization** | | | |
| Conf. 5007: **Human Vision and Electronic Imaging VIII** (Rogowitz, Pappas) p. 18 | | | |
| Conf. 5008: **Color Imaging: Processing, Hardcopy, and Applications VIII** (Eschbach, Marcu) p. 20 | | | |
| Conf. 5009: **Visualization and Data Analysis 2003** (Erbacher, Chen, Roberts, Gröhn, Börner) p. 22 | | Conf. 5010: **Document Recognition and Retrieval X** (Kanungo, Barney Smith, Hu, Kantor) p. 24 | |
| **Imaging for Inspection and Metrology** | | | |
| Conf. 5013: **Videometrics VIII** (El-Hakim, Gruen, Walton) p. 29 | | Conf. 5011: **Machine Vision Applications in Industrial Inspection XI** (Hunt, Price) p. 26 | |
| **Image Processing** | | | |
| | | Conf. 5012: **Real-Time Imaging VII** (Kehtarnavaz, Laplante) p. 28 | |
| Conf. 5014: **Image Processing: Algorithms and Systems II** (Dougherty, Astola, Egiazarian) p. 31 | | | |
| | | Conf. 5015: **Applications of Artificial Neural Networks in Image Processing VIII** (Nasrabadi, Katsaggelos) p. 33 | |
| | Conf. 5016: **Computational Imaging** (Bouman, Stevenson) p. 34 | | |
| **Digital Image Sensors** | | | |
| Conf. 5017B: **Sensors, Cameras, and Applications for Digital Photography Applications V** (Sampat, Motta) p. 36 | Conf. 5017A: **Sensors, Cameras, and Systems for Scientific/Industrial Applications V** (Blouke) p. 35 | | |
| **Multimedia Processing and Applications** | | | |
| Conf. 5018: **Internet Imaging IV** (Santini, Schettini) p. 37 | | Conf. 5019: **Multimedia Computing and Networking 2003** (Rajkumar) p. 39 | |
| Conf. 5020: **Security and Watermarking of Multimedia Contents V** (Delp, Wong) p. 40 | | | |
| | Conf. 5021: **Storage and Retrieval for Media Databases 2003** (Yeung, Lienhart, Li) p.43 | | |
| Conf. 5022: **Image and Video Communications and Processing 2003** (Vasudev, Hsing, Tescher, Ebrahimi) p. 45 | | | |

## Make time for the EXHIBITION!

Wednesday 22 January ..... 10:00 am to 3:00 pm; 5:30 pm to 7:30 pm

Thursday 23 January ..... 10:00 am to 4:00 pm

*See page 63.*

# Short Course Daily Schedule

| Monday | Tuesday | Wednesday | Thursday |
|---|---|---|---|
| **Capture and Display** | | | |
| **SC060** Stereoscopic Display Application Issues (Woods, Merritt) 8:30 am to 12:30 pm, *p.51* | **SC068** Use of CCD and CMOS Sensors in Visible Imaging Applications (Lomheim) 8:30 am to 12:30 pm, *p.52* | | |
| **SC516** Color Considerations for Liquid Crystal Displays (Marcu) 1:30 pm to 5:30 pm, *p.53* | **SC504** Introduction to CCD and CMOS Imaging Sensors and Applications (Janesick) 8:30 am to 5:30 pm, *p.52* | | |
| **SC518** Liquid Crystals for Displays and Telecommunications (Wu) 8:30 am to 12:30 pm, *p.53* | **SC528** Color Imaging with Visible Image Sensors (Lomheim) 1:30 pm to 5:30 pm, *p.55* | | |
| **SC519** Digital Photography Fundamentals (Sampat) 8:30 am to 12:30 pm, *p.54* | | | |
| **SC520** Liquid Crystal Materials and Devices: Tutorial and Laboratory (Crawford) 8:30 am to 5:30 pm, *p.54* | | | |
| **SC522** Holographic Recording Materials (Bjelkhagen) 8:30 am to 12:30 pm, *p.55* | | | |
| **SC523** Embossed Holography (Cvetkovich) 1:30 pm to 5:30 pm, *p.55* | | | |
| **Digital Systems and Engineering** | | | |
| **SC494** How to Select the Right Image Sensor for Your Application (Putnam) 1:30 pm to 5:30 pm, *p.58* | **SC075** Effective Color Computing (Marcu) 8:30 am to 12:30 pm, *p.56* | **SC466** Real Time Systems Design and Analysis (Laplante) 8:30 am to 12:30 pm, *p.56* | |
| **SC513** Practical MTF Metrology for Digital Cameras and Scanners (Burns, Williams) 8:30 am to 5:30 pm, *p.58* | **SC464** Image Processing and Recognition (Javidi) 8:30 am to 5:30 pm, *p.56* | **SC467** Digital Imaging System Fundamentals (Sampat) 8:30 am to 5:30 pm, *p.57* | |
| **SC514** Introduction to Digital Halftoning (Wong, Allebach) 8:30 am to 12:30 pm, *p.59* | **SC526** Software Project Management (Laplante) 8:30 am to 12:30 pm, *p.60* | **SC468** Advanced Image Processing (Rabbani) 8:30 am to 5:30 pm, *p.57* | |
| **SC515** Advanced Concepts in Digital Halftoning (Wong, Allebach) 1:30 pm to 5:30 pm, *p.59* | | **SC491** Neural Network Applications in Image Processing (Nasrabadi) 8:30 am to 5:30 pm, *p.57* | |
| | | **SC511** Applied Imaging Based Morphology (Bonifazi) 1:30 pm to 5:30 pm, *p.58* | |
| | | **SC512** Electronic Imaging Based Morphology (Bonifazi) 8:30 am to 12:30 pm, *p.58* | |
| | | **SC524** Object-Oriented Analysis and Design Using the UML (Neill) 1:30 pm to 5:30 pm, p.60 | |
| | | **SC527** Software Specification and Design for Image Processing (Laplante) 1:30 pm to 5:30 pm, *p.60* | |
| **Data, Internet and Multimedia** | | | |
| **SC080** Fundamentals of Wavelet Image Compression and the Emerging JPEG-2000 Standard (Rabbani) 8:30 am to 5:30 pm, *p.61* | | | **SC521** Analyzing and Visualizing Knowledge Domains (Boerner) 8:30 am to 12:30 pm, *p.61* |
| **SC084** Introduction to Cryptography and Digital Watermarking (Podilchuk, Delp) 8:30 am to 5:30 pm, *p.61* | | | **SC525** Introduction to Information Assurance: How Secure is Your Data? (Erbacher) 1:30 pm to 5:30 pm, *p.62* |
| **General Interest** | | | |
| | | **SC517** An Introduction to Marketing for Scientists and Engineers (Gilblom) 9:00 am to 12:00 pm, 5:00 pm to 6:00 pm, *p.62* | |

*Full course descriptions on pages 50–62.*

*Register for Short Courses p. 71.*

# Plenary Sessions

**Wednesday, 22 January 2003**

## Digital Image Processing: How Far Are We?

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

Recipient of the 2003 Electronic Imaging Scientist of the Year award.

This talk will briefly review and criticize major achievements in the field. Lessons learned will be discussed. Then a few high potential, promising avenues will be introduced, such as visual information representation, medical imaging, surveillance and multimodal information management.

**Murat Kunt** was born in Ankara, Turkey, on January 16, 1945. He received his M.S. in Physics and his Ph.D. in Electrical Engineering, both from the Swiss Federal Institute of Technology, Lausanne, Switzerland, in 1969 and 1974, respectively. From 1974 to 1976, he was a visiting scientist at the Research Laboratory of Electronics of the Massachusetts Institute of Technology where he developed compression techniques for X-ray images and electronic image files. In 1976, he returned to the Swiss Federal Institute of Technology (EPFL) where, presently, he is Professor of Electrical Engineering and Director of the Signal Processing Institute, one of the largest at EPFL. He conducts teaching and research in digital signal and image processing with applications to modeling, coding, pattern recognition, scene analysis, industrial developments and biomedical engineering. His laboratory participates in a large number of European projects under various programmes such as Esprit, Eureka, Race, HCM, Commett and Cost. He is the author or co-author of more than 200 research papers and fifteen books and holds seven patents. He is the Editor-in-Chief of the *Signal Processing Journal* and a founding member of EURASIP, the European Association for Signal Processing. He serves as a chairman and/or a member of the Scientific Committees of several international conferences and on the editorial boards of the *Proceedings of the IEEE, Pattern Recognition Letters* and *Traitement du Signal.* He was the co-chairman of the first European Signal Processing Conference held in Lausanne in 1980 and the general chairman of the International Image Processing Conference (ICIP'96) held in Lausanne in 1996. He was the President of the Swiss Association for Pattern Recognition from its creation until 1997. He consults for governmental offices including the French General Assembly. He received the gold medal of EURASIP for meritorious services, the IEEE ASSP technical achievement award, the IEEE Third Millennium Medal, an honorary doctorate from the Catholic University of Louvain and the technical achievement award of EURASIP in 1983, 1997, 2000, 2001 and 2002.

**Thursday, 23 January 2003**

## Computer Vision and Computer Graphics: Direct and Inverse Problems

**Tomaso A. Poggio,** Artificial Intelligence Laboratory and McGovern Institute for Brain Research, Massachusetts Institute of Technology

The ill-posed problem of learning is one of the main gateways to making intelligent machines and to understanding how the brain works. In this talk I will give an up-to-date outline of some of our recent efforts in developing machines that learn, especially in the context of visual interfaces. Our work on statistical learning theory is being applied to classification (and regression) in various domains -- and in particular, to applications in computer vision and computer graphics. In this talk, I will summarize our work on trainable, hierarchical classifiers for problems in object recognition and especially for face and person detection. I will also describe how we used the same learning techniques to synthesize a photorealistic animation of a talking human face. Finally, I will speculate briefly on the implication of our research on how visual cortex learns to recognize and perceive objects.

**Tomaso A. Poggio,** Ph.D. is the Eugene McDermott Professor at the Department of Brain and Cognitive Sciences; Co-Director, Center for Biological and Computational Learning; Member for the last 20 years of the Artificial Intelligence Laboratory at MIT; and, since 2000, member of the faculty of the McGovern Institute for Brain Research. His work is motivated by the belief that the problem of learning is the gateway to making intelligent machines and understanding how the brain works. Research on learning in his CBCL group of about 30 researchers, follows three basic directions: mathematics of statistical learning theory and ill-posed problems, engineering applications (in computer vision, computer graphics, bioinformatics, intelligent search engines and artificial markets) and neuroscience of learning, presently focused on the problem of how the brain learns to recognize and represent objects in higher areas of visual cortex.

Earlier Prof. Poggio had worked on the visual system of the fly with W. Reichardt in Tuebingen at the Max Planck Institut fuer Biologische Kybernetik and with D. Marr on computational analysis of human and machine vision. He was responsible for the Vision Machine project at the AI Lab. Serving on the editorial boards of a number of leading interdisciplinary journals, Professor Poggio is a Founding Fellow of the American Association for Artificial Intelligence, an Honorary Associate of the Neuroscience Research Program at Rockefeller University and a member of several scientific and engineering associations including IEEE, AAAS; he is an elected member of the American Academy of Arts and Sciences. Professor Poggio received his doctorate in theoretical physics from the University of Genoa in 1970, had a tenured research position at the Max Planck Institute from 1971 to 1981 when he became Professor at MIT. In the years since then, he has received a number of distinguished international awards in the scientific community. He is the author of hundreds of papers in areas ranging from biophysics to information processing in man and machine, artificial intelligence, machine vision and learning. A former Corporate Fellow of Thinking Machines Corporation, he was and is still peripherally involved in several companies in the areas of bioinformatics, computer graphics, computer vision, computer networks and financial engineering.

*IS&T and SPIE gratefully acknowledge the support of Hewlett-Packard Labs for plenary speaker travel.*

## Electronic Imaging Poster Session

*Exhibition Hall A*

Wednesday 22 January . . . . . 5:30 to 7:30 pm

Conference attendees are invited to the poster session Wednesday evening. Authors of poster papers will be on hand during these sessions to answer questions and provide in-depth discussion concerning their papers. Attendees are requested to wear their conference registration badges to the poster sessions.

Authors can set up posters after 9:00 am on Wednesday. Poster supplies (pushpins) will be available in Exhibition Hall A. Other supplies can be obtained from the Speakers' Audio Visual Desk.

Posters can be previewed during the days of the events before the formal poster sessions begin at 5:30 pm.

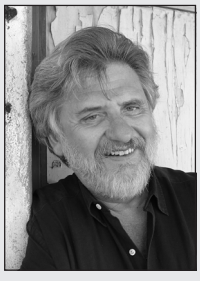
Authors must remove their papers at the conclusion of the poster reception for that day. It is the author's responsibility to remove their posters. Papers not removed will be considered unwanted and will be discarded. The Societies assume no responsibility for posters left up after the end of each night's poster reception.

## *New This Year!* All-Conference Banquet

Thursday 23 January . . . . . 7:30 pm to 9:30 pm

Plan to join us for this great opportunity to get to know your Electronic Imaging colleagues. All attendees are invited to relax, and enjoy a pleasant dinner with friends old and new! Please order your discounted ticket in advance by checking the box on the conference registration form. (US$30) Advance registration is required.

## *Banquet Speaker:* Reinventing Photojournalism in The Digital Age



**Dirck Halstead,** *The Digital Journalist*

By 1970, Life Magazine had reached the pinnacle of 8 million subscribers per week, making it the most influential publication in the world. Two years later, *Life* went out of business. There were a lot of reasons, but the primary one was that television had taken over the role that Henry Luce had assigned to the magazine of "showing our readers the world." *Time* and *Newsweek* tried to replace *Life* with coverage of the events of our times.

But by the early nineties, MBAs and lawyers had won the battle that had traditionally established a "church-state" barrier between editorial and publishers. Editorial budgets were dramatically slashed. Photojournalists were called home. Today, editorial photojournalism stands at a low-water mark. There is simply no space or money to expend on the kind of photographic layouts that are in the tradition of the old *Life*. So what are photojournalists, who still harbor the passion of documenting their times, to do?

Riding to the rescue of this profession is the World Wide Web.

Online publications such as the Digital Journalist have both the space and time to publish major essays similar to those of the old *Life*. In addition, now sound and video can be integrated into the packages to deliver rich multimedia content.

**Dirck Halstead** is the Editor and Publisher of *The Digital Journalist.* He is the former Senior White House Photographer for *Time Magazine,* with 51 covers of the magazine to his credit, a record. He has won the prestigious Robert Capa Award for his coverage of the fall of Saigon. Today, he is a Fellow at the Center of American History at the University of Texas in Austin, and a lecturer in the "New Visual Journalism" in the school of photojournalism at UT.

## Holography Display

Tuesday to Thursday 21–23 January

Holograms related to the topics presented in the Practical Holography XVII and Holographic Materials IX conferences will be on display in the Convention Center Exhibit Hall A.

## Women in Optics Lunch

Tuesday, 21 January, 12 . . . . . 1 pm

Sign up onsite when you register. Restaurant to be announced.

# Technical Group Meetings

*Members and nonmembers alike are invited to attend these informative meetings that provide excellent networking opportunities.*

## Electronic Imaging

Tuesday 21 January . . . . . 7:30 to 9:30 pm

*Chair:* **Arthur Weeks,** University of Central Florida

This group addresses diverse research, engineering, and specialized applications of electronic imaging devices or systems. Because of the diverse topical areas within electronic imaging, the technical group covers image processing, image capture, display and hardcopy, system integration, visualization, and low-light instrumentation. Application areas are just as far-reaching. They include industrial automation, graphic arts, aerospace sensing, remote sensing, high-resolution television, optimal fiber tele-imaging, document processing, medical imaging, and all areas of digital image processing, including restoration, compression, and analysis.

## Holography

Tuesday 21 January . . . . . 7:00 to 9:00 pm

*Chairs:* **Hans I. Belkhagen,** De Montfort Univ. (United Kingdom); **Raymond K. Kostuk,** Univ. of Arizona

The Holography Technical Group is involved with the whole record of research, engineering, and applications in holographic optical elements, nondestructive testing, computer-generated holography, materials and processing, commercial and artistic applications of holography, and standardization issues. This meeting will focus on recent developments in the field and directions it is taking, and serve as a networking and informal cooperative instructional opportunity.

## High Speed Imaging and Analysis

Tuesday, January 21

Business meeting . . . . . 6:00 to 6:45 pm

Refreshment break . . . . . 6:45 to 7:00 pm

Panel discussion . . . . . 7:00 to 8:30 pm

*Chair:* **Kazuyoshi Takayama,** Tohoku Univ. (Japan)
*Immediate Past Chair:* **Frank Kosel,** DRS Hadland

This group provides a forum for scientists and engineers practicing in the field of high-speed and ultra-high-speed photography/videography, and photonics. Following the annual business meeting of the Technical Group and a refreshment break, this year's meeting will feature a panel discussion:

**The Present and Future of High Speed Imaging**
*Panelists to be announced.*

# Conference 5002

Wednesday–Thursday 22–23 January 2003 • *Proceedings* Vol. 5002

# Projection Displays IX

*Conference Chair:* **Ming H. Wu,** Hamamatsu Corp.

*Program Committee:* **Patrick Candry,** Barco Projection Systems N.V. (Belgium); **Dah Yu Cheng,** Cheng Technology & Services; **Arlie R. Conner,** Corning Precision Lens; **Stephen K. Eckhardt,** 3M Co.; **Fang C. Ho,** Industrial Technology Research Institute (Taiwan); **Larry J. Hornbeck,** Texas Instruments Inc.; **Robert J. Martinsen,** Novalux, Inc.; **Shoichi Matsumoto,** Liquid Crystal Technology and Information Ctr. (Japan); **KuoTung G. Tiao,** Prokia Technology Co., Ltd. (Taiwan)

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

**SESSION 1 . . . . . Wed. 9:30 to 10:30 am**

### Projection Display Technology I

**Personal projectors based on VCSEL arrays,** V. M. Bove, Jr., W. Sierra, MIT Media Lab. . . . . [5002-01]

**Rapid automatic alignment of a tiled digital projection system,** M. Lamvik, S. Grego, E. Martin, D. Fox, MCNC . . . . . [5002-02]

**High-luminance and high-resolution 5 degree poly-crystal phosphor screen,** G. Yang, J. Cheng, Z. Lin, Q. Wang, W. Chen, Univ. of Electronic Science and Technology (China) . . . . . [5002-03]

**SESSION 2 . . . . . Wed.11:00 am to 12:20 pm**

### Light Source Technology

**Advanced UHP lamps for projection systems** *(Invited Paper),* G. Heusler, U. Hechtfischer, A. Körber, H. Mönch, P. Pekarski, A. Ritz, Philips Research Labs. (Germany) . . . . . [5002-04]

**Dual paraboloid reflector and polarization recycling systems for projection displays** *(Invited Paper),* K. K. Li, Wavien, Inc. . . . . [5002-05]

Lunch/Exhibition Break

**SESSION 3 . . . . . Wed. 1:50 to 3:10 pm**

### Display Characterization Technology

**Temporal capture and sequence reconstruction for evaluation of display systems and video content,** J. W. Roberts, T. Comstock, National Institute of Standards and Technology . . . . . [5002-06]

**Colorimetric characterization of projection displays using digital still cameras,** L. Seime, SINTEF Electronics and Cybernetics (Norway); T. Skogstad, Norwegian Univ. of Science and Technology (Norway); J. Y. Hardeberg, Gjovik Univ. College (Norway) . . . . . [5002-07]

**Measurement methodology for vertically aligned nematic reflective microdisplays,** D. Cuypers, IMEC (Belgium); H. De Smet, Univ. Gent (Belgium); G. P. Van Doorselaer, J. Van den Steen, IMEC (Belgium); A. Van Calster, Univ. Gent (Belgium) . . . [5002-08]

**Grayscale study in color reproduction and luminance ratio for wide-viewing-angle AM-LCDs,** S. Suzuki, H. Takizawa, International Display Technology (Japan) [5002-09]

**SESSION 4 . . . . . Wed. 3:40 to 4:40 pm**

### Projection Display Technology II

**DottyToto: a measurement engine for aligning multiprojector display systems,** M. Hereld, I. R. Judson, R. Stevens, Argonne National Lab. . . . . [5002-10]

**Quantitative model for calculating viewing angle of projection systems,** C. R. Wolfe, Jenmar Visual Systems Inc. . . . . [5002-11]

**Characterization of BLackScreen™ for rear-projection television,** C. R. Wolfe, C. Esguerra, K. Lewis, K. W. Kinosian, D. W. Vance, J. Vu, Jenmar Visual Systems Inc. . . . . [5002-12]

### ✔ Posters–Wednesday

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

✔ **MTF measurement for optical engine of CRT rear projection HDTV,** J. S. Song, Y. W. Lee, H. Y. Lee, I. W. Lee, Korea Research Institute of Standards and Science (Korea); J. H. Jo, Hannam Univ. (Korea); J. H. Kim, S. K. Choi, Sekonix Co., Ltd. (Korea) . . . . . [5002-16]

✔ **New synthetic evaluation of color display using polychromatic MTF,** J. S. Song, Y. W. Lee, I. W. Lee, Korea Research Institute of Standards and Science (Korea); J. H. Jo, Hannam Univ. (Korea) . . . . . [5002-17]

✔ **Virtual display with low-power consuming portable microprojector,** Z. Zalevsky, Tel Aviv Univ. (Israel); Y. Kapelner, E. Sabo, S. Kapelner, Explay Ltd. (Israel) . . . . . [5002-18]

## Thursday 23 January

**Plenary Speaker . . . . . Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

**SESSION 5 . . . . . Thurs. 9:30 to 11:20 am**

### Projection Display Technology III

**3M PBS for high-performance LCOS optical engine** *(Invited Paper),* D. Asstuen, C. L. Bruzzone, S. K. Eckhardt, 3M Co. . . . . [5002-13]

**Novel optics for high-performance digital projection systems and monitors: current and future,** Y. G. Hong, J. W. Bowron, Raytheon-ELCAN Optical Technologies (Canada) . . . . . [5002-14]

**Optics of digital cinema,** G. P. Pinho, Christie Digital Systems (Canada) . . . [5002-15]

Order Proceedings now and take advantage of the special prepublication price: $53

*Proceedings V*olume 5002.

*See p. 71 to order.*

# Conference 5003

Tuesday–Wednesday 21–22 January 2003 • *Proceedings* Vol. 5003

# Liquid Crystal Materials, Devices, and Applications IX

*Conference Chair:* **Liang-Chy Chien,** Kent State Univ.

*Program Committee:* **Dick J. Broer,** Philips Research Labs. (Netherlands); **Harry J. Coles,** Univ. of Cambridge (UK); **Gregory P. Crawford,** Brown Univ.; **John W. Goodby,** Univ. of Hull (UK); **Wolfgang Haase,** Technische Univ. Darmstadt (Germany); **Shunsuke Kobayashi,** Science Univ. of Tokyo (Japan); **Shui-Chih A. Lien,** IBM Thomas J. Watson Research Ctr.; **Shohei Naemura,** Merck Japan, Ltd. (Japan); **Shin-Tson Wu,** CREOL/Univ. of Central Florida

## Tuesday 21 January

### SESSION 1 . . . . . Tues. 8:30 to 10:00 am

**Liquid Crystal Displays I**

*Chair:* **Liang-Chy Chien,** Kent State Univ.

**Electrically commanded surfaces (ECS): A new liquid crystal display concept** *(Invited Paper),* L. Komitov, B. Helgee, G. Andersson, I. Dahl, Chalmers Univ. of Technology and Göteborg Univ. (Sweden); J. Felix, Chalmers Technology Licensing AB (Sweden); A. Matharu, Nottingham Trent Univ. (UK) . . . . . [5003-01]

**Stratified LCDs: paintable LCDs produced by photo-enforced stratification** *(Invited Paper),* S. I. Klink, R. Penterman, J. Vogels, E. Huitema, H. de Koning, D. J. Broer, Philips Research Labs. (Netherlands) . . . . . [5003-02]

**Advanced liquid crystal materials with negative dielectric anisotropy for monitor and TV applicaitons,** S. E. Lee, E. Y. Kim, D. J. Kang, T. Jacob, Merck Advanced Technologies Ltd. (Korea) . . . . . [5003-03]

### SESSION 2 . . . . . Tues.10:30 to 11:50 am

**Liquid Crystal Displays II**

*Chair:* **Lachezar Komitov,** Chalmers Univ. of Technology (Sweden)

**Binem display: a nematic device switched by surface anchoring breaking** *(Invited Paper),* P. Martinot-Lagarde, Univ. de Paris-Sud (France); I. N. Dozov, Nemoptic (France) . . . . . [5003-04]

**Holographic polymer-dispersed liquid crystals in display applications** *(Invited Paper),* R. L. Sutherland, L. V. Natarajan, V. P. Tondiglia, Science Applications International Corp.; T. J. Bunning, Air Force Research Lab. . . . . [5003-05]

**Polymer-enhanced bend-mode nematic displays,** S. H. Kim, L. C. Chien, Kent State Univ. . . . . [5003-06]

Lunch Break

### SESSION 3 . . . . . Tues. 1:30 to 3:20 pm

**Liquid Crystals I**

*Chair:* **Satyendra Kumar,** Kent State Univ.

**Thresholdless switchable FLC materials** *(Invited Paper),* W. Haase, Technische Univ. Darmstadt (Germany); L. M. Blinov, S. A. Pikin, Technische Univ. Darmstadt (Germany) and Shubnikov Institute of Crystallography (Russia); F. Podgornov, Technische Univ. Darmstadt (Germany); E. P. Pozhidaev, Technische Univ. Darmstadt (Germany) and P.N. Lebedev Physical Institute (Russia); S. P. Palto, Shubnikov Institute of Crystallography (Russia) . . . . . [5003-07]

**Development of bistable ferroelectric liquid crystal photoswitches triggered by dithienylethene dopants** *(Invited Paper),* R. P. Lemieux, K. E. Maly, Queen's Univ. (Canada); M. D. Wand, Displaytech, Inc. . . . . [5003-08]

**Photocrosslinked film of polymers having chalconyl moiety and their alignment's capability for liquid crystal materials** *(Invited Paper),* N. Koide, T. Mihara, Science Univ. of Tokyo (Japan) . . . . . [5003-09]

**Spatial light modulator system as dynamic diffractive element,** S. Krueger, HoloEye Photonics AG (Germany); G. K. Wernicke, F. Kallmayer, H. Gruber, Humboldt-Univ. zu Berlin (Germany); A. Steinhoff, HoloEye Photonics AG (Germany) . . . . . [5003-20]

### SESSION 4 . . . . . Tues. 3:50 to 5:50 pm

**Emerging Liquid Crystals Technologies I**

*Chair:* **Wolfgang Haase,** Technische Univ. Darmstadt (Germany)

**Photon energy conversion in dye-doped liquid crystals** *(Invited Paper),* M. Kreuzer, DaimlerChrysler AG (Germany) . . . . . [5003-10]

**Light shutters and electro-optical storage devices from antiferroelectric liquid crystals of bent-shape molecules** *(Invited Paper),* A. Jakli, Kent State Univ.; D. Kroerke, S. Rauch, H. Sawade, P. Bault, G. Heppke, Technische Univ. Berlin (Germany); K. Fodor-Csorba, Research Institute for Solid State Physics and Optics (Hungary); G. G. Nair, Ctr. for Liquid Crystal Research (India) . . . . . [5003-11]

**Different limits of phase separation and their applications** *(Invited Paper),* S. Kumar, Kent State Univ. . . . . [5003-12]

**Novel 3D display using an array of LCD panels** *(Invited Paper),* Y Takaki, Tokyo Univ. of Agriculture and Technology (Japan) . . . . . [5003-29]

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

### SESSION 5 . . . . . Wed. 9:30 to 10:30 am

**Liquid Crystal Displays III**

*Chair:* **Naoyuki Koide,** Science Univ. of Tokyo (Japan)

**Fabrication and electrooptic characteristics of polymer-stabilized V-mode FLCD and intrinsic H-V-mode FLCD: their application to AM LCDs** *(Invited Paper),* S. Kobayashi, Science Univ. of Tokyo (Japan) . . . . . [5003-13]

**Improvement of optical films for high-performance LCDs** *(Invited Paper),* Y. Fujimura, H. Yoshimi, Nitto Denko Corp. (Japan) . . . . . [5003-14]

### SESSION 6 . . . . . Wed.11:00 to 11:50 am

**Liquid Crystal Displays IV**

*Chair:* **Shunsuke Kobayashi,** Science Univ. of Tokyo (Japan)

**Low-power driving methods for TFT-LCDs** *(Invited Paper),* O. K. Kwon, Hanyang Univ. (Korea) . . . . . [5003-15]

**High-resolution optics for thin Si-film crystallization using excimer lasers: present status and future development,** H. J. Kahlert, MicroLas Lasersystem GmbH (Germany) . . . . . [5003-16]

Lunch/Exhibition Break

Order Proceedings now and take advantage of the special prepublication price: $53

*Proceedings V*olume 5003.

*See p. 71 to order.*

## SESSION 7 . . . . . Wed. 1:30 to 3:00 pm

### Liquid Crystal Technologies for Telecom

*Chair:* **Markus Kreuzer,** DaimlerChrysler AG (Germany)

**Liquid-crystal applications in optical telecommunication** *(Invited Paper),* C. Mao, M. Xu, W. Feng, T. Huang, K. Wu, J. Liu, Chorum Technologies Inc. . . . . [5003-17]

**Liquid crystals devices for fiber optical applications,** V. G. Chigrinov, Hong Kong Univ. of Science and Technology (Hong Kong) . . . . . [5003-18]

**Development of a variable beam deflector with simple structure using liquid crystal devices,** S. Sato, N. Hashimoto, Citizen Watch Co., Ltd. (Japan) . . . . . [5003-19]

**Synthesis and electro-optical properties of novel fluoro-isothiocyanated liquid crystal compounds for VA-LCD** *(Invited Paper),* Y. B. Kim, S. D. Roh, Konkuk Univ. (Korea) . . . . . [5003-30]

## SESSION 8 . . . . . Wed. 3:50 to 5:20 pm

### Emerging Liquid Crystals Technologies II

*Chair:* **Robert P. Lemieux,** Queen's Univ. (Canada)

**Azobenzene polymer-stabilized ferroelectric liquid crystals: photoalignment and morphology** *(Invited Paper),* Y. Zhao, N. Paiement, Univ. de Sherbrooke (Canada) . . . . . [5003-21]

**Liquid crystal physical gels: electrooptical properties and self-organized structures** *(Invited Paper),* T. Kato, N. Mizoshita, Y. Suzuki, Univ. of Tokyo (Japan); K. Hanabusa, Shinshu Univ. (Japan) . . . . . [5003-22]

**Electroluminescence of columnar mesogenic compounds** *(Invited Paper),* T. Hassheider, S. A. Benning, Univ. of Paderborn (Germany); H. Bock, Univ. Bordeaux I (France); H. S. Kitzerow, Univ. of Paderborn (Germany) . . . . . [5003-26]

### ✔ Posters–Wednesday

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

✔ **Self-action of Gaussian beam in a nematic liquid crystal,** S. Subota, V. Y. Reshetnyak, National Taras Shevchenko Univ. of Kyiv (Ukraine) . . . . . [5003-23]

✔ **New electro-optic linear polarizer for visible light,** M. Ortiz-Gutíerrez, Univ. Michoacana de San Nicolás de Hidalgo (Mexico); A. Olivares-Pérez, M. Pérez-Cortés, J. Ibarra-Torres, Instituto Nacional de Astrofísica Óptica y Electrónica (Mexico) . . . . . [5003-24]

✔ **Director profile in the in-plane switching of nematic liquid crystals cell with the strong director anchoring,** O. V. Shevchuk, National Taras Shevchenko Univ. of Kyiv and Ivano-Frankivsk National State Technical Oil and Gas Univ. (Ukraine); V. Y. Reshetnyak, National Taras Shevchenko Univ. of Kyiv (Ukraine); M. Osyptchuk, Ivano-Frankivsk National Technical Oil and Gas Univ. (Ukraine) . . . . . [5003-25]

✔ **Optical-digital implementation by using a LCD of the Fourier transform method for phase retrieval based on the transport irradiance equation,** A. Padilla-Vivanco, J. Baez-Rojas, J. Castro-Ramos, Instituto Nacional de Astrofísica Óptica y Electrónica (Mexico) . . . . . [5003-27]

✔ **TFT-LCD module realizing plural color modes: sRGB and consumer TV-like color,** H. Sugiura, S. Kagawa, H. Kaneko, E. Gofuku, Mitsubishi Electric Corp. (Japan) . . . . . [5003-28]

# Conference 5004

Tuesday–Wednesday 21–22 January 2003 • *Proceedings* Vol. 5004

# Poly-Silicon Thin Film Transistor Technology and Applications in Displays and Other Novel Technology Areas

*Conference Chair:* **Apostolos T. Voutsas,** Sharp Labs. of America

*Program Committee:* **James S. Flores,** Sharp Labs. of America; **Eric Fogarassy,** CNRS-PHASE (France); **Miltiadis K. Hatalis,** Lehigh Univ.; **Masakiyo Matsumura,** Tokyo Institute of Technology (Japan); **Piero Migliorato,** Univ. of Cambridge (UK); **Nigel D. Young,** Philips Research Labs. (UK)

## Tuesday 21 January

**Keynote Presentation . . . . . 8:30 to 9:10 am**

**Future of the display market: major discontinuities or more of the same** *(Keynote Address),* M. Urwin, Cambridge Display Technology (UK) . . . . . [5004-01]

**SESSION 1 . . . . . Tues. 9:10 to 10:10 am**

**Advanced Poly-Si Crystallization Technology I**

**Property of single-crystalline Si TFTs fabricated with micro-Czochralski (grain filter) technique** *(Invited Paper),* R. Ichihara, Technische Univ. Delft (Netherlands) [5004-02]

**High-resolution optics for thin Si-film crystallization using excimer lasers** *(Invited Paper),* H. J. Kahlert, MicroLas Lasersystem GmbH (Germany) . . . . . [5004-03]

**SESSION 2 . . . . . Tues. 10:30 am to 12:10 pm**

**Advanced Poly-Si Crystallization Technology II**

**High-performance polycrystalline silicon TFTs fabricated by high-temperature process with excimer laser annealing,** H. Jiroku, M. Miyasaka, S. Inoue, Y. Tsunekawa, T. Shimoda, Seiko Epson Corp. (Japan) . . . . . [5004-04]

**Novel high-performance TFTs fabricated by selectively enlarging x'tallization (SELAX) technology,** S. Yamaguchi, M. Hatano, S. K. Park, M. Tai, T. Shiba, Hitachi Ltd. (Japan) . . . . . [5004-05]

**Surface planarization for large-grained polycrystalline Si TFTs,** M. Crowder, Y. Mitani, M. Moriguchi, R. S. Sposili, A. T. Voutsas, Sharp Labs. of America . . . . . [5004-06]

**Laboratoire PHASE,** A. Benatmane, P. C. Montgomery, E. Fogarassy, Ctr. National de la Recherche Scientifique (France); D. Zahorski, SOPRA SA (France) . . . . . [5004-07]

**Modeling laser beam spatial separation effects for projection laser crystallization,** H. Kisdarjono, Oregon Graduate Institute of Science and Technology; A. T. Voutsas, Sharp Labs. of America; R. Solanki, Oregon Graduate Institute of Science and Technology . . . . . [5004-08]

Lunch Break

**SESSION 3 . . . . . Tues. 1:30 to 3:10 pm**

**Equipment/Process Technology**

**New laser tool development for mass production of LTPS for AMLCD and OLED,** D. Zahorski, J. Venturini, SOPRA SA (France); A. Tsunemi, Sumitomo Heavy Industries, Ltd. (Japan) . . . . . [5004-09]

**300 W XeCl excimer laser annealing and sequential lateral solidification in low-temperature poly silicon technology,** M. Schiwek, Lambda Physik AG (Germany); B. Fechner, Lambda Physik Japan Co., Ltd. (Japan); U. Rebhan, R. Osmanov, Lambda Physik AG (Germany); H. Kahlert, MicroLas Lasersystem GmbH (Germany) [5004-10]

**Location-controlled crystallization of Si films for TFT circuit applications,** M. Crowder, S. Droes, Y. Mitani, M. Moriguchi, A. T. Voutsas, H. Adachi, Sharp Labs. of America . . . . . [5004-11]

**Trend in excimer laser crystallized poly-si,** D. P. Gosain, T. Fujino, A. Machida, Y. Hituda, Sony Corp. (Japan) . . . . . [5004-12]

**TBD,** A. B. Limanov, Columbia Univ. . . . . [5004-13]

**SESSION 4 . . . . . Tues. 3:30 to 5:20 pm**

**Process Technology**

**Low-temperature plasma deposited microcrystalline silicon thin films: an emerging material for stable thin film transistors,** P. Roca i Cabarrocas, Ecole Polytechnique (France) . . . . . [5004-14]

**Sputtered (PVD) silicon for improved LTPS displays,** J. Xie, R. E. Weiss, B. Kakimoto, P. Ward, Intevac, Inc. . . . . [5004-15]

**TFT threshold voltage adjustment with in situ doped PVD silicon films,** S. Droes, M. Atkinson, P. Guthrie, M. Crowder, A. T. Voutsas, Sharp Labs. of America . . . [5004-16]

**Low-temperature processing of $SiO_2$ thin films by HD-PECVD technique for gate dielectric applications,** P. Joshi, M. Moriguchi, M. Crowder, S. Droes, J. S. Flores, M. Adachi, A. T. Voutsas, J. W. Hartzell, Sharp Labs. of America . . . . . [5004-17]

**Advance oxide for LTPS TFT application,** B. S. Park, G. Furata, T. K. Won, Q. Shang, AKT, Inc. . . . . [5004-18]

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

**SESSION 5 . . . . . Wed. 9:30 to 10:20 am**

**Poly-Si AM-OLED Technology**

**Use of high-efficiency phosphorescent OLEDs in both passive and active matrix displays** *(Invited Paper),* M. S. Weaver, R. C. Kwong, A. B. Chwang, J. J. Brown, Universal Display Corp. . . . . [5004-19]

**Polysilicon TFT AM-OLED on thin flexible metal substrate,** T. Afentakis, M. K. Hatalis, Lehigh Univ.; A. T. Voutsas, Sharp Labs. of America . . . . . [5004-20]

**Advanced poly-LED displays** *(Invited Paper),* M. Childs, Philips Research Labs. (UK); G. Nisato, Philips Electronics Nederland B.V. (Netherlands) . . . . . [5004-21]

**Small-molecule OLED with Alq3 derivative,** J. Cheng, G. Yang, Z. Lin, W. Chen, Q. Jiang, X. Wei, Z. Yang, M. Xie, Univ. of Electronic Science and Technology of China . . . . . [5004-22]

Lunch/Exhibition Break

Order Proceedings now and take advantage of the special prepublication price: $60

*Proceedings V*olume 5004.

*See p. 71 to order.*

**SESSION 6 . . . . . Wed. 1:30 to 3:10 pm**

**p-Si Device/Circuit Technology**

**State of the art of fine patterned Si TFT** *(Invited Paper),* T. Noguchi, Univ. Paris-Sud XI (France) . . . . . [5004-23]

**Comparative analysis of advanced polysilicon thin-film transistor architectures for drain field relief** *(Invited Paper),* G. Fortunato, IFN-CNR (Italy) . . . . . [5004-24]

**AC measurement for characterizing the trap processes in polysilicon TFTs,** F. Yan, P. Migliorato, Univ. of Cambridge (UK) . . . . . [5004-25]

**Digital-to-analog converter for liquid crystal gamma correction,** H. Walton, M. Brownlow, J. Lock, M. Rahal, P. Zebedee, Sharp Labs. of Europe Ltd. (UK) . . [5004-26]

**SESSION 7 . . . . . Wed. 3:40 to 5:10 pm**

**Alternative Substrates/Applications**

**Separation technology approach to high-performance TFTs on plastics** *(Invited Paper),* Y. Lee, H. Li, S. J. Fonash, The Pennsylvania State Univ. . . . . [5004-27]

**High-performance poly-si circuits on thin metal foils,** T. Afentakis, M. K. Hatalis, Lehigh Univ.; A. T. Voutsas, Sharp Labs. of America . . . . . [5004-28]

**Thin film transistors made of nanocrystalline silicon deposited at 150<degree>C,** I. C. Cheng, S. Wagner, Princeton Univ. . . . . [5004-29]

**Polysilicon TFT technology for biosensor array applications,** T. Afentakis, M. K. Hatalis, Lehigh Univ.; D. W. Greve, X. Huang, Carnegie Mellon Univ. . . . . [5004-30]

**Register by 20 December 2002 and save US $100!**

**Register online!**

Order Proceedings now and take advantage of the special prepublication price: $60

*Proceedings V*olume 5004.

*See p. 71 to order.*

# Conference 5005A

Wednesday–Thursday 22–23 January 2003 • Part of *Proceedings of SPIE* Vol. 5005
Practical Holography XVII and Holographic Materials IX

# Practical Holography XVII

*Conference Chair:* **Tung H. Jeong,** Lake Forest College

*Program Committee:* **Stephen A. Benton,** MIT Media Lab.; **Toshio Honda,** Chiba Univ. (Japan); **Junchang Li,** Kunming Univ. of Science and Technology (China); **Nadya O. Reingand,** CeLight, Inc.; **Sylvia H. Stevenson,** DuPont Holographic Materials

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

### SESSION 1 . . . . . Wed. 9:30 to 10:30 am

*Chair:* **Stephen A. Benton,** MIT Media Lab.

**Full-color holographic 3D printer,** M. Takano, Toppan Printing Co., Ltd. (Japan); H. Sigeta, Tokyo Institute of Technology (Japan); T. Nishihara, Toppan Printing Co., Ltd. (Japan); M. Yamaguchi, Tokyo Institute of Technology (Japan); S. Takahashi, Toppan Printing Co., Ltd. (Japan); N. Ohyama, Tokyo Institute of Technology (Japan); A. Kobayashi, F. Iwata, Toppan Printing Co., Ltd. (Japan) . . . . . [5005-01]

**One-step synthetic hologram printer for full-parallax computer graphics,** S. L. Smith, S. A. Benton, MIT Media Lab. . . . . [5005-02]

**Holographic display with enlarged viewing-zone using high-resolution LC panel,** T. Mishina, M. Okui, Japan Broadcasting Corp. (Japan); K. Doi, Victor Co. of Japan, Ltd. (Japan); F. Okano, Japan Broadcasting Corp. (Japan) . . . . . [5005-03]

### SESSION 2 . . . . . Wed.11:00 am to Noon

*Chair:* **Michael Klug,** Zebra Imaging Inc.

**Drawing holograms by hand,** W. Beaty, Univ. of Washington . . . . . [5005-04]

**Real-time 3D display system based on volume hologram,** H. Kang, C. Ahn, C. Ahn, Electronics and Telecommunications Research Institute (Korea); S. Lee, Kwangwoon Univ. (Korea) . . . . . [5005-05]

**Rainbow hologram by the unique properties,** A. Maripov, N. Kulmurzaev, K. Omurzakov, Kyrgyz Technical Univ. (Kirgizstan) . . . . . [5005-06]

Lunch/Exhibition Break

### SESSION 3 . . . . . Wed. 1:30 to 3:10 pm

*Chair:* **Fujio Iwata,** Toppan Printing Co., Ltd. (Japan)

**Wave optical algorithm for creating digitally synthetic holograms of three-dimensional surface objects,** K. Matsushima, A. Kondoh, Kansai Univ. (Japan) . . . . . [5005-07]

**Digital hologram synthesis based on mathematical morphology,** H. Cao, G. Zhu, Y. Zhu, Huazhong Univ. of Science and Technology (China) . . . . . [5005-08]

**Color digital holography: display,** D. Vukicevic, Univ. Louis Pasteur (France); N. Demoli, Univ. of Zagreb (Croatia) . . . . . [5005-09]

**Resolution improvement using color digital holography,** N. Demoli, Univ. of Zagreb (Croatia); D. Vukicevic, Univ. Louis Pasteur (France) . . . . . [5005-10]

**Visual appearance effect on modified reconstruction color images of optical Fourier transform hologram by means of digital image processing,** M. Iizuka, Tokyo Institute of Polytechnics (Japan); M. Kariya, Jemuko Co., Ltd. (Japan); Y. Nakashima, M. Takamatsu, Toyama Univ. (Japan) . . . . . [5005-11]

**Lowering spatial frequency by using confocal lenses in digital holography,** S. K. Kim, J. Y. Son, Korea Institute of Science and Technology (Korea) . . . . . [5005-12]

Order Proceedings now and take advantage of the special prepublication price: $90

*Proceedings V*olume 5005.

*See p. 71 to order.*

### SESSION 4 . . . . . Wed. 3:40 to 5:00 pm

*Chair:* **Nadya O. Reingand,** CeLight, Inc.

**One-hundred mega-pixel computer-generated holographic images from active tiling: a dynamic and scalable electro-optic modulator system,** M. Stanley, R. W. Bannister, C. D. Cameron, S. D. Coomber, I. Cresswell, J. R. Hughes, P. Jackson, K. Milham, R. Miller, D. A. Payne, D. C. Scattergood, A. Smith, M. A. Smith, P. Watson, P. Webber, C. W. Slinger, QinetiQ (UK) . . . . . [5005-13]

**Beam steering device using CGHs,** J. S. Yoon, N. Kim, Chungbuk National Univ. (Korea) . . . . . [5005-14]

**Fast hologram synthesis for 3D geometry models using graphics hardware,** M. Magnor, C. Petz, Max-Planck-Institut für Informatik (Germany) . . . . . [5005-15]

### ✔ Posters–Wednesday

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

✔ **Noise processing in holographic interferogram and its simulated study,** J. Li, B. Xiong, Kunming Univ. of Science and Technology (China) . . . . . [5005-20]

✔ **Implementation of VHOE-based multiview 3D display system using optimized exposure-time scheduling scheme,** E. S. Kim, B. C. Cho, J. S. Gu, S. C. Kim, Kwangwoon Univ. (Korea) . . . . . [5005-31]

✔ **Hidden surface removal using z-buffer for computer-generated hologram,** Y. Sakamoto, M. Takase, Y. Aoki, Hokkaido Univ. (Japan) . . . . . [5005-32]

✔ **Digital reconstruction of 3D objects with different viewing angles,** L. Yu, L. Cai, Hong Kong Univ. of Science and Technology (Hong Kong) . . . . . [5005-33]

✔ **Multiview hologram screen projected along longitudes of Bragg angle cone,** M. Okamoto, Labs. of Image Information Science and Technology (Japan); E. Shimizu, Osaka City Univ. (Japan) . . . . . [5005-34]

✔ **Practical implementation of the image domain joint transform correlator for holographic security,** M. Borisov, Russian Security Technology Concern (Russia); S. B. Odinokov, Bauman Moscow State Technical Univ. (Russia); L. A. Bondarev, S. V. Kurakin, Russian Security Technology Concern (Russia) . . . . . [5005-35]

✔ **Optical scheme for producing dot-matrix holograms with acousto-optic modulator,** S. B. Odinokov, I. K. Tsiganov, D. S. Lushnikov, Bauman Moscow State Technical Univ. (Russia); V. M. Bashilov, B. Girichev, Scientific Technical Ctr. (Russia) . . . . . [5005-36]

✔ **Optical schemes for recording hidden image Fresnel and Fourier holograms,** S. B. Odinokov, D. S. Lushnikov, I. K. Tsiganov, Bauman Moscow State Technical Univ. (Russia) . . . . . [5005-37]

✔ **Holography for physics education using the simple optical setup,** H. Katsuma, Tama Art Univ. (Japan); T. Shibuya, M. Wakaki, Tokai Univ. (Japan); H. Matsumoto, Chuo Precision Industrial Co., Ltd. (Japan) . . . . . [5005-38]

✔ **Information reduction in hologram by superimposing spatial frequency bands,** S. Nakazaki, K. Sato, M. Morimoto, K. Fujii, Himeji Institute of Technology (Japan) . . . . . [5005-39]

✔ **Change in size of 3D image using a periodic Fourier transform hologram,** K. Sato, S. Nakazaki, M. Morimoto, K. Fujii, Himeji Institute of Technology (Japan)[5005-40]

✔ **Holography with synchronized sources,** G. Arroyo-Correa, A. Olivares-Pérez, V. Sánchez-Villicaña, Instituto Nacional de Astrofísica Óptica y Electrónica (Mexico) . . . . . [5005-41]

✔ **Multicolor reflection hologram made from computer-generated master hologram,** H. Yoshikawa, K. Takei, M. Tachinami, Nihon Univ. (Japan) . . . . . [5005-42]

✔ **Modification of the commercial LCD video projector for high-resolution spatial light modulator,** E. S. Kim, J. S. Koo, M. G. Kim, Kwangwoon Univ. (Korea) . . . . . [5005-43]

✔ **Diffraction efficiency simulation for large off-axis HOES,** T. Tomono, Samsung Electronics Co., Ltd. (Korea) . . . . . [5005-44]

# Conference 5005A

✔ **Digital hologram reconstruction using the dual-wavelength method,** J. H. Kim, N. Kim, Chungbuk National Univ. (Korea) . . . . . [5005-45]

✔ **Holographic edge-illuminated polymer Bragg gratings for dense wavelength division optical filters at 1550 nm,** A. Sato, Toppan Printing Co., Ltd. (Japan) and Univ. of Arizona; M. Scepanovic, R. K. Kostuk, Univ. of Arizona . . . . . [5005-46]

✔ **Research on copying system of dynamic multiplex holographic stereograms,** H. Fu, Capital Normal Univ. (China) . . . . . [5005-47]

✔ **Control system for color holography using one laser,** R. W. Aumiller, S. D. O'Conner, M. Kash, T. H. Jeong, Lake Forest College . . . . . [5005-48]

✔ **Some aspects of using photsensitive materials for recording high efficiency thick holograms**, G. Sobolev, S. B. Soboleva, A. N. Tranova, Holokart Russia . [5005-50]

✔ **Single hologram non spatial filter,** J.E. Ludman, T. D. Upton, D. Coolidge, Northeast Photosciences, Inc. . . . . [5005-51]

## Thursday 23 January

**Plenary Speaker . . . . . Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

### SESSION 5 . . . . . Thurs. 9:30 to 10:30 am

*Chair:* **Toshio Honda,** Chiba Univ. and Telecommunications Advancement Organization (Japan)

**Femtosecond holography,** D. Psaltis, M. Centurion, Z. Liu, California Institute of Technology . . . . . [5005-16]

**Digital in-line holography with numerical reconstruction: 3D imaging and tracking of microstructures and organisms,** H. J. Kreuzer, Dalhousie Univ. (Canada) . . [5005-17]

**Application of holographic interferometry for dynamic vibration analysis of a jet engine turbine compressor rotor,** H. Fein, Polaris Research Group . . . . . [5005-18]

### SESSION 6 . . . . . Thurs.11:00 am to Noon

*Chair:* **Bingheng Xiong,** Kunming Univ. of Science and Technology (China)

**Simulated study on the measurement of the variation of the deflection index of a transparent object using holographic CT method,** J. Li, B. Xiong, L. Zhong, X. Lu, Y. Zhang, Kunming Univ. of Science and Technology (China) . . . . . [5005-19]

**Caustic phenomena in holographic interferometry,** B. Xiong, Kunming Univ. of Science and Technology (China) . . . . . [5005-49]

**Application of computer-generated rainbow holograms of 3D images in optical security devices,** V. I. Girnyk, A. V. Kononov, I. S. Borisov, Optronics Ltd. (Ukraine) . . . . . [5005-21]

Lunch/Exhibition Break

### SESSION 7 . . . . . Thurs. 1:30 to 3:10 pm

**Sylvia H. Stevenson,** DuPont Holographic Materials

**Fabrication and evaluation of a new design compact parallel facial recognition system based on JTC,** E. Watanabe, Japan Women's Univ. (Japan); N. Takeda, Topcon Corp. (Japan); K. Kodate, Japan Women's Univ. (Japan) . . . . . [5005-22]

**Demonstration of holographic smart card system with use of the optical memory technology,** J. H. Kim, J. K. Choi, J. W. An, N. H. Kim, Chungbuk National Univ. (Korea); K. Y. Lee, Sunchon National Univ. (Korea); S. H. Jeon, Incheon National Univ. (Korea) . . . . . [5005-23]

**Pulsed-laser electro-holographic system using the interference fringe image of the CCD,** H. Choi, S. K. Kim, J. Y. Son, Korea Institute of Science and Technology (Korea); J. W. Wu, Ewha Womans Univ. (Korea) . . . . . [5005-24]

**X-ray in-line holography with zone plate magnification,** H. Gao, J. Chen, H. Xie, Z. Xu, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [5005-25]

**New method for x-ray holographic tomography with pre-amplification,** J. Chen, H. Gao, H. Xie, Z. Xu, Shanghai Institute of Optics and Fine Mechanics (China) [5005-26]

### SESSION 8 . . . . . Thurs. 3:40 to 5:00 pm

**Emmett N. Leith,** Univ. of Michigan

**Some reflections on the origin and subsequent course of holography,** E. N. Leith, Univ. of Michigan . . . . . [5005-27]

**Holography and optical computing: the ongoing entanglement,** H. J. Caulfield, Fisk Univ. . . . . [5005-28]

**A crossroads for holography?**, I. M. Lancaster, Reconnaissance International (UK) . . . . . [5005-29]

**Reconstructing the history of holography,** S. F. Johnston, Univ. of Glasgow (UK) . . . . . [5005-30]

Order Proceedings now and take advantage of the special prepublication price: $60

*Proceedings V*olume 5004.

*See p. 71 to order.*

# Conference 5005B

Tuesday 21 January 2003 • Part of *Proceedings of SPIE* Vol. 5005
Practical Holography XVII and Holographic Materials IX

# Holographic Materials IX

*Conference Chair:* **Sylvia H. Stevenson,** DuPont Holographic Materials

*Program Committee:* **Hans I. Bjelkhagen,** De Montfort Univ. (UK); **Günther J. Dausmann,** Holographic Systems München GmbH (Germany); **Gerald L. Heidt,** Consultant; **Fujio Iwata,** Toppan Printing Co., Ltd. (Japan); **Raymond K. Kostuk,** Optical Science Ctr./Univ. of Arizona; **Roger A. Lessard,** Univ. Laval (Canada); **Vladimir B. Markov,** MetroLaser, Inc.; **Gaylord E. Moss,** Moss Optics

*For a full list of sessions and paper order, please check the meeting website at www.electronicimaging.org*


**Wavelet image enhancement applied to holographic data storage,** K. J. Jones, Rice Univ. . . . . [5005-701]

**Holographic data storage media for practical systems,** M. Schnoes, B. Ihas, L. Dhar, D. Michaels, S. Setthachayanon, W. L. Wilson, InPhase Technologies . . . . [5005-702]

**Holographic material composed by dichromated gelatin with vanilla,** A. Olivares-Perez, M. Ortiz-Gutierrez, I. Fuentes-Tapia, Instituto Nacional de Astrofísica Óptica y Electrónica (Mexico) . . . . . [5005-703]

**Effects of the film manufacturing procedure and development process on the holographic properties of HOEs in DCG,** C. G. Stojanoff, RWTH-Aachen (Germany) [5005-704]

**Inharmonic oscillatory dynamics of the holographic gratings formation in liquid crystalline polymers,** M. V. Kozlovsky, F. Podgornov, Technische Univ. Darmstadt (Germany) . . . . . [5005-705]

**Measurement of nonlinear characteristics of silver halide holographic materials by phase-contrast microscopy,** I. Banyasz, Research Institute for Solid State Physics and Optics (Hungary) . . . . . [5005-706]

**Chiral photochromic homo- and copolymers for holography applications,** M. V. Kozlovsky, Technische Univ. Darmstadt (Germany); A. Medvedev, Moscow State Univ. (Russia); F. Podgornov, Technische Univ. Darmstadt (Germany) . . . . . [5005-707]

**Parallel processing optical device using volume holography,** S. Han, B. Yu, H. Kim, J. Park, J. W. Paek, B. Lee, Seoul National Univ. (Korea) . . . . . [5005-709]

**Optimization of a volume phase holographic grism for astronomical observation using the photopolymer,** A. Yamada, K. Oka, Japan Women's Univ. (Japan); N. Ebizuka, RIKEN—The Institute of Physical and Chemical Research (Japan); T. Teranishi, M. Kawabata, Nippon Paint Co., Ltd. (Japan); K. Kodate, Japan Women's Univ. (Japan) . . . . . [5005-710]

**Application of chalcogenide vitreous semiconductors in manufacturing holographic protective elements,** S. A. Kostyukevych, Institute of Semiconductor Physics (Ukraine) . . . . . [5005-711]

**New processing techniques for reflection holograms recorded on BB640 holographic emulsions,** M. Ulibarrena, M. J. Mendez, R. F. Madrigal, S. Blaya, L. Carretero-Lopez, A. Fimia, Univ. Miguel Hernandez de Elche (Spain) . . . . . [5005-712]

**Performance analysis and material dependence of microholographic optical elements as couplers for fiber optic communication,** P. T. Ajithkumar, J. Sathyan, S. Ambadi, Ctr. for Development of Imaging Technology (India); S. Vargese, NeST R&D Ctr. (India) . . . . . [5005-713]

**Emulsions for pulsed holography: new and improved processing schemes,** R. Taylor, Forth Dimension Holographics; A. M. Rodin, GEOLA uab (Lithuania) . . . . . [5005-714]

**Dynamic behavior of a latent image in holographic silver halide recording materials,** J. Coyne, M. P. Torzynski, D. Vukicevic, Univ. Louis Pasteur (France) . . . . . [5005-715]

**Rosin with bromocresol green (BCG) dye as holographic material,** J. C. Ibarra, Instituto Nacional de Astrofísica Óptica y Electrónica (Mexico); E. Montejo Ruiz, Univ. Juarez Autónoma de Tabasco (Mexico); A. Olivares-Perez, Instituto Nacional de Astrofísica Óptica y Electrónica (Mexico); M. O. Gutierrez, Univ. Michoacana de San Nicolás de Hidalgo (Mexico) . . . . . [5005-717]

**Rigid polymer material with hologram enhancement by molecular diffusion,** I. V. Semenova, A.F. Ioffe Physico-Technical Institute (Russia); A. Popov, Lumex, Ltd. (Russia); A. Veniaminov, S.I. Vavilov State Optical Institute (Russia); E. Bartsch, Johannes-Gutenberg-Univ. Mainz (Germany) . . . . . [5005-718]

**Measurement and modeling of the full nonlinear characteristics of silver halide holographic recording materials,** I. Banyasz, Research Institute for Solid State Physics and Optics (Hungary) . . . . . [5005-523]



Order Proceedings now and take advantage of the special prepublication price: $90

*Proceedings V*olume 5004.



*See p. 71 to order.*

# Conference 5006A

Tuesday–Thursday 21–23 January 2003 • Part of *Proceedings of SPIE* Vol. 5006
Stereoscopic Displays and Virtual Reality Systems X

# Stereoscopic Displays and Applications XIV

*Conference Chairs:* **Andrew J. Woods,** Ctr. for Marine Science and Technology/Curtin Univ. of Technology (Australia); **John O. Merritt,** The Merritt Group; **Stephen A. Benton,** MIT Media Lab.

*Program Committee:* **Neil A. Dodgson,** Univ. of Cambridge (UK); **Janusz Konrad,** Boston Univ.; **Shojiro Nagata,** InterVision (Japan); **Lew B. Stelmach,** Communications Research Ctr. Canada; **Vivian K. Walworth,** Jasper Associates

## Tuesday 21 January

### SESSION 1 . . . . . Tues. 8:30 to 10:10 am

**Stereoscopic Display Systems**

*Chair:* **Stephen A. Benton,** MIT Media Lab.

**Binocular retinal scanning laser display with integrated focus cues for ocular accommodation,** B. Schowengerdt, Univ. of Washington and Univ. of California/Davis; E. J. Seibel, J. P. Kelly, N. L. Silverman, T. A. Furness III Univ. of Washington . . . . . [5006-05]

**Random dot stereograms generated with ray tracing as a visualization tool for evaluating stereoscopic camera systems,** C. F. Dadson, Boeing Co. . . . . [5006-02]

**Building a large scale, high-resolution tiled rear-projected passive stereo display system based on commodity component,** G. Bresnahan, R. Gasser, A. Abaravichyus, E. Brisson, M. Walterman, Boston Univ. . . . . [5006-03]

**Screenless 3D television,** C. Moller, O. S. Cossairt, MIT Media Lab.; A. R. Travis, Univ. of Cambridge (UK); S. A. Benton, MIT Media Lab. . . . . [5006-04]

**Light loss reduction of LCD polarized stereoscopic projection,** V. A. Elkhov, Y. N. Ovechkis, Moscow Cinema and Photo Research Institute (Russia) . . . . . [5006-01]

### SESSION 2 . . . . . Tues.10:30 am to 12:10 pm

**Autostereoscopic Displays I: Integral Imaging**

*Chair:* **Shojiro Nagata,** Intervision (Japan)

**Integral three-dimensional television based on super-high-definition video system,** J. Arai, M. Kobayashi, H. Shimamoto, M. Okui, F. Okano, NHK Science and Technical Research Labs. (Japan) . . . . . [5006-06]

**Full parallax images with a diamond shape pixel cell,** J. Y. Son, V. V. Saveljev, Y. J. Choi, J. E. Bahn, Korea Institute of Science and Technology (Korea) . . . . . [5006-07]

**Computer generation of integral 3D images with maximum effective viewing angle,** J. Ren, A. Aggoun, M. McCormick, De Montfort Univ. (UK) . . . . . [5006-08]

**Integral 3D imaging that has an enhanced viewing-angle along full direction with no mechanical movement,** S. Jung, J. Park, H. Choi, B. Lee, Seoul National Univ. (Korea) . . . . . [5006-09]

**Digital three-dimensional object reconstruction and correlation based on integral imaging,** Y. Frauel, Univ. Nacional Autónoma de México; B. Javidi, Univ. of Connecticut . . . . . [5006-10]

Lunch Break

### SESSION 3 . . . . . Tues. 1:30 to 3:10 pm

**Autostereoscopic Displays II**

*Chair:* **Neil A. Dodgson,** Univ. of Cambridge (UK)

**True 3D without glasses: two large-screen autostereoscopic displays,** A. L. Smeyne, Northrop Grumman Corp.; G. R. Martin, Chromux Corp. (UK) . . . . . [5006-11]

**High-resolution autostereoscopic immersive imaging display using a monocentric optical system,** J. M. Cobb, D. Kessler, J. A. Agostinelli, Eastman Kodak Co. [5006-12]

**Real image based autostereoscopic display using a LCD panel, mirrors, and lenses,** H. Kakeya, Univ. of Tsukuba (Japan) . . . . . [5006-13]

**Desktop autostereoscopic display using compact LED projector,** H. Kaneko, T. Ohshima, O. Ebina, A. Arimoto, Hitachi, Ltd. (Japan) . . . . . [5006-14]

**Second version of 3D display system by fan-like array of projection optics,** T. Honda, Chiba Univ. (Japan); M. Shimomatsu, H. Imai, Telecommunications Advancement Organization of Japan; S. Kobayashi, Chiba Univ. (Japan); H. Nate, K. Susami, Telecommunications Advancement Organization of Japan; H. Iwane, Chiba Univ. (Japan) . . . . . [5006-15]

### SESSION 4 . . . . . Tues. 3:30 to 5:30 pm

**Autostereoscopic Displays III**

*Chair:* **John O. Merritt,** The Merritt Group

**Special features of stereo visualization in multichannel autostereoscopic display from 4D vision,** I. Relke, A. Grasnick, 4D-Vision GmbH (Germany) . . . . . [5006-16]

**Applications of the interactive multiview autostereoscopic display system to visual ergonomic, anatomical, and heritage images,** S. Nagata, Intervision (Japan); M. Onodera, Y. Nozaka, Iwate Medical Univ. (Japan); A. Nakazawa, Univ. of Tokyo (Japan); K. Ikeuchi, Univ. of Tokyo (Japan) . . . . . [5006-17]

**Full-time full-resolution dual stereoscopic/autostereoscopic display or rock solid 3D: no-flicker fullresolution dual-use dynamic autostereoscopic display,** P. Kleinberger, H. Goldberg, I. Kleinberger, Y. Y. Mantinband, 3ality Ltd. (Israel) . . . . . [5006-18]

**Position and velocity depending subpixel correction for spatial-multiplexed autostereoscopic displays,** M. Andiel, S. Hentschke, Univ. Kassel (Germany) . . . . . [5006-19]

**Three-dimensional volumetric display by inclined-plane scanning,** D. Miyazaki, Univ. of California/San Diego; T. Eto, Y. Nishimura, K. Matsushita, Osaka City Univ. (Japan) . . . . . [5006-20]

**SOLIDFELIX 3D display: a static volume display,** K. Langhans, C. Guill, E. Rieper, Youth Research Ctr. of Applied Sciences (Germany) . . . . . [5006-21]

**3D Screening Session . . . . . 5:30 to 6:30 pm**

See large screen examples of how 3D video is being used and produced around the world.

**Stereoscopic Displays and Applications Dinner . . . . . 7 pm to late**

A no-host, informal dinner open to all SD&A attendees will be held at a local Santa Clara restaurant. Details will be available at the conference.

Order Proceedings now and take advantage of the special prepublication price: $90

*Proceedings V*olume 5006.

*See p. 71 to order.*

# Conference 5006A

## Wednesday 22 January

**Plenary Speaker** . . . . . **Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

**SESSION 5** . . . . . **Wed. 9:30 to 10:30 am**

**Stereoscopic Video**

*Chair:* **Andrew J. Woods,** Ctr. for Marine Science and Technology/Curtin Univ. of Technology (Australia)

**Parallax player: a stereoscopic format converter,** M. H. Feldman, L. Lipton, StereoGraphics Corp. . . . . [5006-22]

**Development of the 960p stereoscopic digital video format,** J. Goodman, 21st Century 3D; J. O. Merritt, The Merritt Group . . . . . [5006-23]

**Parallax measurement and its application to the analysis of visual comfort for stereoscopic HDTV,** Y. Nojiri, H. Yamanoue, F. Okano, NHK Science & Technical Research Labs. (Japan) . . . . . [5006-24]

**SESSION 6** . . . . . **Wed.10:50 am to 12:10 pm**

**Stereoscopic Image Coding**

*Chair:* **Lew B. Stelmach,** Communications Research Ctr. Canada

**Low bandwidth stereoscopic image encoding and transmission,** J. Flack, S. Fox, P. V. Harman, Dynamic Digital Depth Inc. (Australia) . . . . . [5006-25]

**Perceptual evaluation of JPEG-coded stereoscopic images,** P. Seuntiens, L. Meesters, W. A. IJsselsteijn, Eindhoven Univ. of Technology (Netherlands) . . . . . [5006-26]

**Effect of the compression of the depth map image on depth-fused 3D image quality,** K. Uehira, Kanagawa Institute of Technology (Japan); S. Suyama, H. Takada, NTT Cyber Space Labs. (Japan) . . . . . [5006-27]

**Progressive coding of stereo images using a hybrid scheme,** T. Palfner, E. Müller, Univ. Rostock (Germany) . . . . . [5006-28]

Lunch/Exhibition Break

**SESSION 7** . . . . . **Wed. 1:30 to 3:10 pm**

**Human Factors I**

*Chair:* **John O. Merritt,** The Merritt Group

**Geometry about distortions of stereoscopic image,** M. Okamoto, Labs. of Image Information Science and Technology (Japan); E. Shimizu, Osaka City Univ. (Japan) . . . . . [5006-29]

**Depth from stereograms lacking binocular disparity,** I. P. Howard, P. Duke, York Univ. (Canada) . . . . . [5006-30]

**Determinants of perceived image quality: ghosting vs. brightness,** L. M. Wilcox, York Univ. (Canada); J. A. Stewart, Queen's Univ. (Canada) . . . . . [5006-31]

**Improving the visual comfort of stereoscopic images,** L. B. Stelmach, W. J. Tam, F. Speranza, R. Renaud, Communications Research Ctr. Canada . . . . . [5006-32]

**Enhancement of stereoscopic comfort by fats control of frequency content with wavelet transform,** N. Lemmer, G. Moreau, P. Fuchs, Ecole des Mines de Paris (France) . . . . . [5006-33]

**SESSION 8** . . . . . **Wed. 3:40 to 4:40 pm**

**Human Factors II**

*Chair:* **Lew B. Stelmach,** Communications Research Ctr. Canada

**Evaluating accuracy and precision in a stereoscopic display: perception of 3D object motion,** J. M. Harris, Univ. of Newcastle upon Tyne (UK) . . . . . [5006-34]

**Comparison of stereoscopic and non-stereoscopic video images for visual telephone systems,** W. J. Tam, A. Vincent, R. Renaud, P. Blanchfield, T. Martin, Communications Research Ctr. Canada . . . . . [5006-35]

**Survey of perceptual quality issues in three-dimensional television systems,** L. Meesters, W. A. IJsselsteijn, P. Seuntiens, Eindhoven Univ. of Technology (Netherlands) . . . . . [5006-36]

**Panel Discussion** . . . . . **Wed. 4:40 to 5:40 pm**

**The Future of Stereoscopic Imaging**

*Panel Moderator:* **Lenny Lipton,** StereoGraphics Corp.

*Panel Members:* **Daniel J. Sandin,** Univ. of Illinois/Chicago; **Stephen A. Benton,** MIT Media Lab.; **Mark T. Bolas,** Fakespace Inc.; **Dave Cook,** NVIDIA Corp.; **Jeff Fergason,** Ilixco Inc.

## Thursday 23 January

**Plenary Speaker** . . . . . **Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

**SESSION 9** . . . . . **Thurs. 9:30 am to Noon**

**Stereoscopic Image Processing**

*Chair:* **Janusz Konrad,** Boston Univ.

**Stereoscopic visualization and reconstruction of turbulent flames,** W. B. Ng, Y. Zhang, Univ. of Manchester Institute of Science and Technology (UK) . . . . . [5006-37]

**Artifact reduction in lenticular multiscopic 3D displays by means of antialias filtering,** J. Konrad, P. Agniel, Boston Univ. . . . . [5006-38]

**Producing anaglyphs from synthetic images,** D. F. McAllister, W. R. Sanders III, North Carolina State Univ. . . . . [5006-39]

**Hardware-accelerated autostereogram rendering for interactive 3D visualization,** C. Petz, B. Goldluecke, M. Magnor, Max-Planck-Institut für Informatik (Germany) . . . . . [5006-40]

**Adaptive disparity estimation scheme using balanced stereo image sequences,** K. H. Bae, Y. O. Kim, E. S. Kim, Kwangwoon Univ. (Korea) . . . . . [5006-41]

**Synthesizing stereo 3D views from focus cues in monoscopic 2D images,** S. Aguirre Valencia, R. M. Rodriguez-Dagnino, Instituto Tecnologico y de Estudios Superiores (Mexico) . . . . . [5006-42]

Lunch/Exhibition Break

Order Proceedings now and take advantage of the special prepublication price: $90

*Proceedings V*olume 5006.

*See p. 71 to order.*

# Conference 5006A

**SESSION 11 . . . . . Thurs. 1:30 to 2:10 pm**

**Poster Pop Session**

*Chair:* **Vivian K. Walworth,** Jasper Associates

*Poster authors will give a 5-minute oral review of their poster. Posters will be available for viewing during the demonstration session.*

✔ **Parallel-axis stereoscopic camera with vergence control and multiplexing functions,** G. Lee, N. Hur, C. Ahn, C. Ahn, Electronics and Telecommunications Research Institute (Korea) . . . . . [5006-43]

✔ **Crosstalk issue affecting stereopsis in stereoscopic,** K. C. Huang, J. C. Yuan, C. H. Tsai, W. J. Hsueh, Industrial Technology Research Institute (Taiwan) . . [5006-44]

✔ **StereoGraphics cinema server,** J. Wuopio, R. A. Akka, L. Lipton, StereoGraphics Corp. . . . . [5006-45]

✔ **Three-dimensional color digital imaging system,** Z. Zhang, X. Peng, Tianjin Univ. (China) . . . . . [5006-46]

✔ **Examination of stereoscopic 3D display system using correction lens,** T. Kawai, T. Shibata, K. Ohta, Waseda Univ. (Japan); Y. Yoshihara, Arisawa Manufacturing Co., Ltd. (Japan); T. Inoue, Kanagawa Institute of Technology (Japan); T. Iwasaki, Univ. of Occupational and Environmental Health (Japan) . . . . . [5006-47]

✔ **Pioneering block-based stereo image CODEC in wavelet domain,** E. A. Edirisinghe, Y. Nayan, Loughborough Univ. (UK) . . . . . [5006-48]

✔ **Large-scale projection using integral imaging techniques,** R. Kotecha, M. McCormick, N. A. Davies, De Montfort Univ. (UK) . . . . . [5006-49]

✔ **Automatic control of parallel stereoscopic camera by disparity compensation,** K. C. Kwon, N. Kim, Y. S. Choi, Chungbuk National Univ. (Korea); S. K. Gil, Suwon Univ. (Korea) . . . . . [5006-50]

**Hardware Demonstrations and Author Interviews . . . . .** Thurs. 2:10 to 4:30 pm

**Demonstrations of Stereoscopic Display, Virtual Reality, Augmented Reality, and Telepresence Technologies**

Interactive, hands-on demonstrations of stereoscopic hardware and display content to support presentations given in the conferences "Stereoscopic Displays and Applications XIV" and "The Engineering Reality of Virtual Reality 2003."

**SESSION 10 . . . . . Thurs. 4:30 to 5:30 pm**

**Keynote Presentation**

**Stereoscopic Displays** *(Keynote Address),* . . . . . [5006-51]

Visit www.stereoscopic.org for the latest information on the Stereoscopic Displays and Applications Conference program.

Order Proceedings now and take advantage of the special prepublication price: $90

*Proceedings V*olume 5006.

*See p. 71 to order.*

# Conference 5006B

Friday 24 January 2003 • Part of *Proceedings of SPIE* Vol. 5006
Stereoscopic Displays and Virtual Reality Systems X

# The Engineering Reality of Virtual Reality 2003

*Conference Chair:* **Mark T. Bolas,** Fakespace Labs., Inc. and Keio Univ. (Japan)

*Program Committee:* **Nick England,** 3rdTech, Inc.; **Shojiro Nagata,** Japan 3D Forum/InterVision (Japan); **Daniel J. Sandin,** Univ. of Illinois/Chicago; **Andreas Simon,** Fraunhofer Institute for Media Communciation (Germany); **Henry A. Sowizral,** Terabeam, Inc.

## Friday 24 January

### SESSION 11 . . . . . Fri. 8:30 to 10:10 am

**Techniques and Applications**

*Chair:* **Shojiro Nagata,** Intervision (Japan)

**New visibility computing algorithm for three-dimensional indoor walkthroughs,** Q. Liu, Sichuan Bureau of Surveying and Mapping (China); D. Li, Wuhan Univ. (China) . . . . . [5006-52]

**Design of a navigation system with collision detector including a repulsive force by force feedback emulation,** K. J. Kim, Y. H. Chai, Chung-Ang Univ. (Korea) . . [5006-53]

**Toward enhanced data consistency in distributed virtual environments,** S. J. Kim, F. Kuester, K. H. Kim, Univ. of California/Irvine . . . . . [5006-54]

**Virtual immersive review for car design,** D. Paillot, F. Merienne, M. Neveu, J. P. Frachet, Ecole Nationale Supérieure d'Arts et Metiers (France); S. Thivent, PSA Peugeot Citroen (France) . . . . . [5006-55]

**Virtual reality applied to teletesting,** T. J. van den Berg, R. Smeenk, TNO Physics and Electronics Lab. (Netherlands); P. Jacques, Spacebel Informatics (Belgium); A. Mazy, Ctr. Spatial de Liège (Belgium); L. Arguello, European Space Research and Technology Ctr. (Netherlands) . . . . . [5006-56]

### SESSION 12 . . . . . Fri.10:30 am to 12:10 pm

**Focused Research**

*Chair:* **Daniel J. Sandin,** Univ. of Illinois/Chicago

**Three-dimensional techniques for capturing and building virtual models of complex objects for use in scientific and industrial applications, data archiving, and the entertainment industry,** A. Andersen, Virtual Surfaces Inc.; B. Wilcox, Point Data Marketing . . . . . [5006-57]

**Using virtual models to study the biomechanics and behavior of extinct animals,** R. Chapman, Smithsonian's National Museum of Natural History; A. Andersen, Virtual Surfaces Inc.; B. Wilcox, Point Data Marketing . . . . . [5006-58]

**Wearable augmented reality system using an IrDA device and a passometer,** R. Tenmoku, M. Kanbara, N. Yokoya, Nara Institute of Science and Technology (Japan) . . . . . [5006-59]

**Vision-based registration for augmented reality using monocular and binocular vision,** S. Vallerand, M. Kanbara, N. Yokoya, Nara Institute of Science and Technology (Japan) . . . . . [5006-60]

**Calibration method for an omnidirectional multicamera system,** S. Ikeda, T. Sato, N. Yokoya, Nara Institute of Science and Technology (Japan) . . . . . [5006-61]

Lunch Break

### SESSION 13 . . . . . Fri. 1:50 to 3:10 pm

**Augmented Reality**

*Chair:* **Andreas Simon,** Fraunhofer Institut für Arbeitswirtschaft und Organisation (Germany)

**On-board camera pose estimation in augmented reality space for direct visual navigation,** Z. Hu, Matrox Electronic Systems Ltd. (Canada); K. Uchimura, Kumamoto Univ. (Japan) . . . . . [5006-62]

**Flexible augmented reality architecture applied to environmental management,** T. Romao, Univ. of Evora and New Univ. of Lisbon (Portugal); N. M. Correia, New Univ. of Lisbon (Portugal); E. Dias, Univ. of Evora and New Univ. of Lisbon (Portugal); A. Trabuco, C. Santos, R. Santos, E. Nobre, A. Camara, New Univ. of Lisbon (Portugal); J. Danado, Univ. of Evora and New Univ. of Lisbon (Portugal); L. Romero, New Univ. of Lisbon (Portugal) . . . . . [5006-63]

**Real-time 3D hand tracking in a virtual environment,** K. Smith, Univ. of Illinois/Urbana-Champaign; D. J. Sandin, Univ. of Illinois/Chicago; T. Huang, Univ. of Illinois/Urbana-Champaign; J. Eliason, Univ. of Illinois/Chicago . . . . . [5006-64]

**Hierarchical depth estimation for image synthesis in mixed reality,** H. Kim, K. Sohn, Yonsei Univ. (Korea) . . . . . [5006-65]

### SESSION 14 . . . . . Fri. 3:30 to 5:30 pm

**Video-Based Image Techniques and Emerging Work**

*Chair:* **Mark T. Bolas,** Fakespace Labs., Inc. and Keio Univ. (Japan)

**Experimental system of free viewpoint television,** P. Na Bangchang, T. Fujii, M. Tanimoto, Nagoya Univ. (Japan) . . . . . [5006-66]

**INPRES system and augmented reality for craniofacial surgery,** T. Salb, Univ. Karlsruhe Technische Hochschule (Germany); J. Brief, T. Welzel, Ruprecht-Karls-Univ. Heidelberg (Germany); B. Giesler, Univ. Karlsruhe Technische Hochschule (Germany); S. Hassfeld, J. Mühling, Ruprecht-Karls-Univ. Heidelberg (Germany); R. Dillmann, Univ. Karlsruhe Technische Hochschule (Germany) . . . . . [5006-67]

**Depth keying,** G. Yahav, A. Kaplan, R. Gvili, E. Ofek, 3DV Systems Ltd. (Israel) . . . . . [5006-68]

Order Proceedings now and take advantage of the special prepublication price: $90

*Proceedings V*olume 5006.

*See p. 71 to order.*

# Conference 5007

Tuesday–Friday 21–24 January 2003 • *Proceedings* Vol. 5007

# Human Vision and Electronic Imaging VIII

*Conference Chairs:* **Bernice E. Rogowitz,** IBM Thomas J. Watson Research Ctr.; **Thrasyvoulos N. Pappas,** Northwestern Univ.

*Program Committee:* **Albert J. Ahumada, Jr.,** NASA Ames Research Ctr.; **Jan P. Allebach,** Purdue Univ.; **Walter R. Bender,** MIT Media Lab.; **Michael H. Brill,** Sarnoff Corp.; **John C. Dalton,** Synthetik; **Scott J. Daly,** Sharp Labs. of America; **Gunilla A. Derefeldt,** FOA (Sweden); **Huib de Ridder,** Technische Univ. Delft (Netherlands); **Miguel P. Eckstein,** Univ. of California/Santa Barbara; **Elena A. Fedorovskaya,** Eastman Kodak Co.; **Jennifer Gille,** Raytheon ITSS; **Stanley A. Klein,** Univ. of California/Berkeley; **Jan J. Koenderink,** Univ. Utrecht (Netherlands); **John J. McCann,** McCann Imaging; **Karol Myszkowski,** Max-Planck-Institut für Informatik (Germany); **Adar Pelah,** Univ. of Cambridge (UK); **Ann M. Rohaly,** Tektronix, Inc.; **Robert J. Safranek,** Lucent Technologies/Bell Labs.; **Christopher W. Tyler,** Smith-Kettlewell Eye Research Institute; **Andrew B. Watson,** NASA Ames Research Ctr.

## Tuesday 21 January

**SESSION 1 . . . . . Tues.10:30 to 11:50 am**

**Keynote Session I**

**SESSION 2 . . . . . Tues. 1:30 to 2:50 pm**

**Keynote Session II**

**SESSION 3 . . . . . Tues. 3:10 to 5:30 pm**

**Image Quality**

**General perceptual contrast metric,** A. Liberg, D. Hasler, Genimedia SA (Switzerland) . . . . . [5007-01]

**Contrast discrimination and contrast appearance require different visual mechanisms,** J. Xing, NASA Ames Research Ctr. . . . . [5007-02]

**Measuring images: differences, quality, and appearance,** G. M. Johnson, M. D. Fairchild, Rochester Institute of Technology . . . . . [5007-03]

**Forensic analysis of print using digital image analysis,** J. Tchan, London College of Printing (UK) . . . . . [5007-04]

**Suprathreshold image compression based on contrast allocation and global precedence,** D. M. Chandler, S. S. Hemami, Cornell Univ. . . . . [5007-05]

**Measuring colorfulness in real images,** D. Hasler, S. E. Süsstrunk, Ecole Polytechnique Fédérale de Lausanne (Switzerland) . . . . . [5007-06]

**Digital item adaptation for color vision variations,** Y. M. Ro, J. Song, S. J. Yang, C. S. Kim, Information and Communications Univ. (Korea) . . . . . [5007-07]

**Annual Human Vision and Electronic Imaging Banquet**

The annual Human Vision and Electronic Imaging Banquet will be held on Tuesday, 21 January 7:30 to 10:00 p.m. The banquet will take place in a local restaurant or wine cellar, and will include an exciting invited speaker. For more information, and subscription, please visit our conference web site: http://www.ece.northwestern.edu/~pappas/hvei

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

**SESSION 4 . . . . . Wed.10:10 am to Noon**

**Video Quality**

**Streaming video quality evaluation through subjective testing,** R. Campos, S. Winkler, Genimedia SA (Switzerland) . . . . . [5007-08]

**CVQE: a continuous video quality evaluation metric for low bit rates,** M. Masry, S. S. Hemami, Cornell Univ. . . . . [5007-09]

**Some properties of synthetic block and blurry artifacts,** M. Farias, J. M. Foley, S. K. Mitra, Univ. of California/Santa Barbara . . . . . [5007-10]

**Pre-processing of compressed digital video based on perceptual quality metrics,** P. V. Karunaratne, A. K. Katsaggelos, T. N. Pappas, Northwestern Univ. . . . . [5007-11]

Lunch/Exhibition Break

**SESSION 5 . . . . . Wed. 1:50 to 5:20 pm**

**Video Quality II**

**Image appearance modeling,** M. D. Fairchild, G. M. Johnson, Rochester Institute of Technology . . . . . [5007-12]

**Mesopic color appearance,** L. W. MacDonald, Y. Kwak, Univ. of Derby (UK) . [5007-13]

**Progress on a computational model of achromatic color processing,** M. E. Rudd, Univ. of Washington . . . . . [5007-14]

**Non-von-Kries 3-parameter color prediction,** B. V. Funt, H. Jiang, Simon Fraser Univ. (Canada) . . . . . [5007-15]

**Incomplete color adaptation: the role of cone pigment absorption,** J. J. McCann, McCann Imaging . . . . . [5007-16]

**Assuring quality of color graphics for aerospace interfaces,** L. Arend, NASA Ames Research Ctr. . . . . [5007-17]

**Visual display characterization using flicker photometry techniques,** G. J. Braun, Eastman Kodak Co. . . . . [5007-18]

**Color naming for image color composition,** S. Mojsilovic, B. E. Rogowitz, IBM Thomas J. Watson Research Ctr. . . . . [5007-19]

Discussion Session . . . . . 5:20 to 6:20 pm

## Thursday 23 January

**Plenary Speaker . . . . . Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

**SESSION 6 . . . . . Thurs.10:10 am to Noon**

**Eye Movements**

**Eye tracking observers during color image evaluation tasks,** J. S. Babcock, J. B. Pelz, M. D. Fairchild, Rochester Institute of Technology . . . . . [5007-20]

**Maintaining perceived quality for interactive tasks using selective rendering,** K. Cater, A. Chalmers, Univ. of Bristol (UK) . . . . . [5007-21]

**High-level aspects of oculomotor control during viewing of natural-task images,** R. L. Canosa, J. B. Pelz, N. R. Mennie, Rochester Institute of Technology . . . . . [5007-22]

**Individual predictions of eye movements with dynamic scenes,** E. Barth, J. Drewes, T. Martinetz, Univ. of Lübeck (Germany) . . . . . [5007-23]

Lunch/Exhibition Break

## SESSION 7 ..... Thurs. 1:50 to 3:10 pm

### 3D Shape

**Wavelet-based 3D extension to the live-wire approach,** T. Haenselmann, W. Effelsberg, Univ. Mannheim (Germany) ..... [5007-24]

**Synthesis of three-dimensional neural structures using graph grammars,** R. C. Coelho, O. V. Jaques, M. S. Almeida, L. G. Valentim, Univ. Estadual de Maring (Brazil) ..... [5007-25]

**Estimating Gaussian curvature from 3D meshes,** J. Peng, Q. Li, Univ. of Southern California; M. Zhou, Huazhong Univ. of Science and Technology (China); C.-C. J. Kuo, Univ. of Southern California ..... [5007-26]

**Use of finite element method in 3D structure and motion estimation of non-rigid objects,** T. Balomenos, A. Drosopoulos, A. Raouzaiou, K. Karpouzis, S. D. Kollias, National Technical Univ. of Athens (Greece) ..... [5007-27]

## SESSION 8 ..... Thurs. 3:40 to 5:20 pm

### Graphics

**Three varieties of realism in computer graphics,** J. A. Ferwerda, Cornell Univ. ..... [5007-28]

**Color of specular highlights,** E. Angelopoulou, S. Poger, Stevens Institute of Technology ..... [5007-29]

**Ecological model of glittering texture,** M. Vallet, D. Paillé, Collège de France (France); A. Monot, Muséum National d'Histoire Naturelle (France); A. Kemeny, Collège de France (France) ..... [5007-30]

**Design of a tone mapping operator for high-dynamic range images based upon psychophysical evaluation and preference mapping,** F. Drago, Iwate Univ. (Japan); W. L. Martens, Univ. of Aizu (Japan); K. Myszkowski, Max-Planck-Institut für Informatik (Germany); N. Chiba, Iwate Univ. (Japan) ..... [5007-31]

**Showing shape with texture: two directions are better than one,** S. Kim, H. Hagh-Shenas, V. Interrante, Univ. of Minnesota ..... [5007-32]

# Friday 24 January

## SESSION 9 ..... Fri. 8:30 to 10:10 am

### Image Analysis and Digital Libraries

**Perceptual color and texture features for segmentation,** J. Chen, T. N. Pappas, Northwestern Univ.; S. Mojsilovic, B. E. Rogowitz, IBM Thomas J. Watson Research Ctr. ..... [5007-33]

**Nonlinear image representation with statistical independent features: efficient implementation and applications,** R. Valerio, R. Fonolla Navarro, Consejo Superior de Investigaciones Cientificas (Spain) ..... [5007-34]

**Efficacy of non-verbal markings in multimedia II: some considerations,** S. H. Bean, Univ. College Cork (Ireland) ..... [5007-35]

**Human factor study of image orientation determination,** J. Luo, A. Singhal, R. T. Gray, Eastman Kodak Co. ..... [5007-36]

**Characterizing the high-level content of natural images using lexical basis functions,** J. A. Black, Jr., G. F. Fahmy, K. Kahol, P. Kuchi, S. Panchanathan, Arizona State Univ. ..... [5007-37]

# Friday 24 January

## SESSION 10 ..... Fri.10:30 am to 12:10 pm

### Perception in Virtual Reality and Art

**Navigating mazes in a virtual environment,** R. A. Browse, D. B. Skillicorn, D. Middleman, Queen's Univ. (Canada) ..... [5007-38]

**Effect of force and acoustic feedback on teleoperation work,** Z. Cui, K. Matsunaga, K. Shidoji, Kyushu Univ. (Japan) ..... [5007-39]

**Failure of motion capture in an object disappearance paradigm,** L. T. Likova, C. W. Tyler, Smith-Kettlewell Eye Research Institute ..... [5007-40]

**Staircase illusion: computer sees the staircases as human sees?** S. Ina, Tsukuba College of Technology (Japan); K. Tabata, Univ. of Library and Information Science (Japan) ..... [5007-41]

**Sampling of post-Riley visual artists surreptitiously probing perception,** S. J. Daly, Sharp Labs. of America ..... [5007-42]

Lunch Break

## SESSION 11 ..... Fri. 1:30 to 3:00 pm

### Posters and Demo Session

*Posters will be available for viewing during the demonstration session.*

✔ **Line-display: a new system component for indirect viewing,** H. G. Biverot, Linus AB (Sweden) ..... [5007-43]

✔ **Faithful presentation of luminance contrast: evaluation of photographic and computational display methods,** E. Phillips, G. Ward, Exponent, Inc.; T. J. Ayres, Consultant ..... [5007-44]

✔ **Study of systematic chromatic changes in color space to model color transparency,** P. Gerardin, S. E. Süsstrunk, Ecole Polytechnique Fédérale de Lausanne (Switzerland); K. Knoblauch, INSERM (France) ..... [5007-45]

✔ **Contrast measures for predicting text readability,** L. F. Scharff, Stephen F. Austin State Univ.; A. J. Ahumada, Jr., NASA Ames Research Ctr. ..... [5007-46]

✔ **How are letter channels selected?**, B. Tjan, Univ. of Southern California; S. Chung, Indiana Univ.; G. E. Legge, Univ. of Minnesota/Twin Cities ..... [5007-47]

✔ **Efficient shape-based image similarity computation through contours evolution,** K. Ge, S. Oe, Univ. of Tokushima (Japan) ..... [5007-48]

✔ **Registration-tolerant extended visual cryptography,** M. Nakajima, Y. Yamaguchi, Univ. of Tokyo (Japan)[5007-49]

Discussion Session ..... 3:00 to 4:00 pm

Order Proceedings now and take advantage of the special prepublication price: $70

*Proceedings V*olume 5007.

*See p. 71 to order.*

# Conference 5008

Tuesday–Friday 21–24 January 2003 • *Proceedings* Vol. 5008

# Color Imaging VIII: Processing, Hardcopy, and Applications

*Conference Chairs:* **Reiner Eschbach,** Xerox Corp.; **Gabriel G. Marcu,** Apple Computer, Inc.

*Program Committee:* **A. Ufuk Agar,** Hewlett-Packard Labs.; **Jan P. Allebach,** Purdue Univ.; **Jan Bares,** NexPress Solutions, LLC; **Makoto Fujino,** Seiko Epson Corp. (Japan); **Roger D. Hersch,** Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Patrick G. Herzog,** RWTH-Aachen (Germany); **Hiroaki Ikegami,** Fuji Xerox Co., Ltd. (Japan); **Jae H. Kim,** Pusan National Univ. (Korea); **Helmut Kipphan,** Heidelberger Druckmaschinen AG (Germany); **Michael A. Kriss,** Sharp Labs. of America; **Shaun T. Love,** Lexmark International, Inc.; **Chris Tuijn,** Agfa-Gevaert N.V. (Belgium)

## Tuesday 21 January

### SESSION 1 . . . . . Tues. 1:00 to 3:00 pm

**Color Perception and Appearance**

*Chair:* **Reiner Eschbach,** Xerox Corp.

**Subjective perception of natural scenes: the role of color** *(Invited Paper),* N. Bianchi-Berthouze, Univ. of Aizu (Japan) . . . . . [5008-01]

**Cross-media tonal mapping model obtained from psychometric experiments,** S. Livens, Agfa-Gevaert N.V. (Belgium); A. Anthonis, Univ. Antwerpen (Belgium); M. F. Mahy, Agfa-Gevaert N.V. (Belgium); P. Scheunders, Univ. Antwerpen (Belgium) . . . . . [5008-02]

**YACCD: yet another color constancy database,** A. Rizzi, D. Marini, C. Gatta, Univ. degli Studi di Milano (Italy) . . . . . [5008-03]

**Unconstrained web-based color naming experiment,** N. Moroney, Hewlett-Packard Labs. . . . . [5008-04]

**Modifying CIECAM97s surround induction parameters for complex images in graphic arts viewing conditions,** P. J. Green, D. Harrington, London Institute (UK) . . [5008-05]

### SESSION 2 . . . . . Tues. 3:30 to 5:10 pm

**Image Enhancement**

*Chair:* **Alessandro Rizzi,** Univ. degli Studi di Milano (Italy)

**Improvement of color quality with modified linear multiscale retinex,** T. Watanabe, Y. Kuwahara, A. Kojima, T. Kurosawa, Matsushita Electric Industrial Co., Ltd. (Japan) . . . . . [5008-06]

**Enhancing photographic color images by the modified law of power,** J. M'Boliguipa, E. Tonye, R. Nanci Yossi, M. Melouta, Univ. of Yaounde 1 (Cameroon) . . . . . [5008-07]

**Restoring color document images with show-through effects by multiscale analysis,** H. Nishida, T. Suzuki, Ricoh Co., Ltd. (Japan) . . . . . [5008-08]

**Color image enhancement technique using gamut mapping based on color space division,** Y. H. Cho, Y. T. Kim, Kyungpook National Univ. (Korea); C. H. Lee, Kyungwoon Univ. (Korea); Y. H. Ha, Kyungpook National Univ. (Korea) . . . . . [5008-09]

**Tunable cast remover for digital photographs,** F. Gasparini, R. Schettini, Technologie Informatiche Multimediali/CNR (Italy); P. Gallina, Olivetti I-Jet S.p.a. (Italy) [5008-10]

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

### SESSION 3 . . . . . Wed. 9:30 to 10:30 am

**Applications I**

*Chair:* **Shaun T. Love,** Lexmark International, Inc.

**Geometric invariance in describing color features,** L. V. Tran, R. Lenz, Linköping Univ. (Sweden) . . . . . [5008-11]

**Using DE* metrics for measuring color variation in hard-copy pictorial images,** S. Farnand, Eastman Kodak Co. . . . . [5008-12]

**Improving and streamlining the workflow in the graphic arts and printing industry,** C. Tuijn, Agfa-Gevaert N.V. (Belgium) . . . . . [5008-13]

### SESSION 4 . . . . . Wed.11:00 am to Noon

**Applications II**

*Chair:* **Chris Tuijn,** Agfa-Gevaert N.V. (Belgium)

**Practical application of an artist's color model as an alternative to CMYK: eight colors and beyond,** C. Parraman, S. Hoskins, Univ. of the West of England (UK) . . . . . [5008-14]

**Perceptual approach for unsupervised digital color restoration of cinematographic archives,** M. Chambah, B. Besserer, Univ. de La Rochelle (France); C. Gatta, D. Marini, A. Rizzi, Univ. degli Studi di Milano (Italy) . . . . . [5008-15]

**Image segmentation of stained glass,** L. W. MacDonald, A. Giani, C. Machy, Univ. of Derby (UK) . . . . . [5008-16]

Lunch/Exhibition Break

### SESSION 5 . . . . . Wed. 1:30 to 3:10 pm

**Capturing**

*Chair:* **Michael A. Kriss,** Sharp Labs. of America

**Hierarchical approach to the optimal design of camera spectral sensitivities for colorimetric and spectral performance,** S. Quan, N. Ohta, R. S. Berns, Rochester Institute of Technology; N. Katoh, Sony Corp. (Japan) . . . . . [5008-17]

**Estimation of spectral distribution of scene illumination from a single image with chromatic illuminant,** Y. T. Kim, Kyungpook National Univ. (Korea); C. H. Lee, Kyungwoon Univ. (Korea); J. Y. Kim, Youngsan Univ. (Korea); Y. H. Ha, Kyungpook National Univ. (Korea) . . . . . [5008-18]

**Fast linear method of illumination classification,** T. J. Cooper, F. A. Baqai, Sony Electronics Inc. . . . . [5008-19]

**New constraint on spectral reflectance and its application in illuminant detection,** X. Jiang, M. D. Fairchild, Rochester Institute of Technology . . . . . [5008-20]

**Characterization of a digital camera as an absolute tristimulus colorimeter,** F. Martinez-Verdu, Univ. de Alicante (Spain); J. Pujol, M. Vilaseca, Univ. Politecnica de Catalunya (Spain); P. Capilla, Univ. de Valencia (Spain) . . . . . [5008-21]

### SESSION 6 . . . . . Wed. 3:40 to 5:20 pm

**Spectral Imaging**

*Chair:* **Roger D. Hersch,** Ecole Polytechnique Fédérale de Lausanne (Switzerland)

**Comparative study on spectral estimation,** S. Quan, N. Ohta, Rochester Institute of Technology . . . . . [5008-22]

**Spectral estimation of human skin color using the Kubelka-Munk theory,** M. Doi, S. Tominaga, Osaka Electro-Communication Univ. (Japan) . . . . . [5008-23]

**Spectrum-based color reproduction system for motion picture,** K. Ohsawa, H. Fukuda, Telecommunication Advancement Organization of Japan; Y. Komiya, Olympus Optical Co., Ltd. (Japan); M. Yamaguchi, N. Ohyama, Tokyo Institute of Technology (Japan) . . . . . [5008-24]

**One-parameter subgroups and the chormaticity of illumination spectra,** R. Lenz, T. H. Bui, Linköping Univ. (Sweden); J. Hernandez-Andres, Univ. de Granada (Spain) . . . . . [5008-25]

**Hyperspectral imaging: the colorimetric high ground,** L. Kleiman, Spectral Masters, Inc. . . . . [5008-26]

Order Proceedings now and take advantage of the special prepublication price: $90

*Proceedings V*olume 5008 will be available onsite.

### ✔ Posters–Wednesday

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

✔ **Gamut boundary determination for a color printer using the face triangulation method,** P. Pellegri, R. Schettini, Technologie Informatiche Multimediali/CNR (Italy) . . . . . [5008-29]

✔ **OTF analysis of paper defections and a modified Murray-Davies model of halftone images,** Y. Zhang, H. Hamisu, Wuxi Univ. of Light Industry (China) . . . . [5008-58]

✔ **Identification of microbes based on color sampling,** C. K. Reddy, F. Dazzo, F. I. Liu, Michigan State Univ. . . . . [5008-59]

✔ **Character recognition of instrument board in sequent color images,** N. Li, G. Wang, H. Bao, Nanjing Univ. of Aeronautics and Astronautics (China) . [5008-60]

✔ **Neutralizing paintings with a projector,** I. Bell, Univ. of Waterloo (Canada) . . . . . [5008-61]

## Thursday 23 January

**Plenary Speaker . . . . . Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

### SESSION 7 . . . . . Thurs. 9:50 to 10:30 am

**Printing**

*Chair:* **A. U. Agar,** Hewlett-Packard Labs.

**Three-dimensional separation method maximizing the printer gamut,** H. Zeng, Hewlett-Packard Co. . . . . [5008-27]

**Are genetic algorithms useful for spectral-based printer characterization?,** S. Zuffi, Istituto Biotechnologie e Bioimmagini/CNR (Italy); R. Schettini, Technologie Informatiche Multimediali/CNR and DISCO/Univ. degli Studi di Milano Bicocca (Italy); G. Mauri, DISCO/Univ. degli Studi di Milano Bicocca (Italy) . . . . . [5008-28]

### SESSION 8 . . . . . Thurs.11:00 am to Noon

**Color Control on Displays**

*Chair:* **Gabriel G. Marcu,** Apple Computer, Inc.

**Color quality management in advanced flat panel display engines,** F. Lebowsky, C. F. Neugebauer, STMicroelectronics Inc. . . . . [5008-30]

**User-preferred color temperature conversion for video on TV or PC,** D. S. Park, S. K. Kim, C. Y. Kim, W. H. Choi, S. D. Lee, Y. S. Seo, Samsung Advanced Institute of Technology (Korea) . . . . . [5008-31]

**Absolute and relative colorimetric evaluation for precise color on screen,** J. S. Kirkenaer, F. H. Herbert, J. A. Ladson, Integrated Color Solutions, Inc. . . . . [5008-32]

Lunch/Exhibition Break

### SESSION 9 . . . . . Thurs. 1:30 to 3:10 pm

**Standards and Color Management**

*Chair:* **Jan Bares,** NexPress Solutions, LLC

**Standardization: colorful or dull?**, F. L. van Nes, ERGONES (Netherlands) . . [5008-33]

**Multimedia integration and IEC/ISO's scRGB,** M. Stokes, Microsoft Corp. . [5008-34]

**Color management with a hammer: the B-spline fitter,** I. Bell, B. H. P. Liu, Univ. of Waterloo (Canada) . . . . . [5008-35]

**Derivation of efficient color-space conversion formulae for n-dimensional interpolation,** G. W. Braudaway, IBM Thomas J. Watson Research Ctr. . . . . [5008-36]

**Neutral gray adjustment in printer ICC profiles,** H. Zeng, Hewlett-Packard Co. . . . . [5008-37]

### SESSION 10 . . . . . Thurs. 3:40 to 5:20 pm

**Color Reproduction**

*Chair:* **Gabriel G. Marcu,** Apple Computer, Inc.

**Color imaging for everyone: counterfeiting and forensic implications** *(Invited Paper),* A. B. Jaffe, Annette Jaffe Consulting . . . . . [5008-38]

**Retaining color fidelity in multiple generation reproduction using digital watermarks,** Z. Fan, S. Wang, H. Cheng, Xerox Corp. . . . . [5008-39]

**Determining visually achromatic colors on substrates with varying chromaticity,** P. J. Green, I. O'Neill, London Institute (UK) . . . . . [5008-40]

**Technology of duotone color transformations,** S. Herron, Xerox Corp. . . . . [5008-41]

## Friday 24 January

### SESSION 11 . . . . . Fri. 8:30 to 10:10 am

**Color and Moiré**

*Chair:* **Jan P. Allebach,** Purdue Univ.

**Variations on error diffusion: retrospectives and future trends** *(Invited Paper),* B. L. Evans, V. Monga, Univ. of Texas/Austin; N. Damera-Venkata, Hewlett-Packard Labs. . . . . [5008-42]

**Relevance of 19th century continuous tone photomechanical printing techniques to digitally generated imagery,** S. Hoskins, C. Parraman, Univ. of the West of England (UK) . . . . . [5008-43]

**Non-orthogonal screen and its application in moiré-free halftoning,** S. Wang, Z. Fan, Z. Wen, Xerox Corp. . . . . [5008-44]

**Novel color palettization scheme for preserving important colors,** J. Luo, K. E. Spaulding, Q. Yu, Eastman Kodak Co. . . . . [5008-45]

### SESSION 12 . . . . . Fri.10:30 am to 12:10 pm

**New Architectures and Halftoning**

*Chair:* **Jan P. Allebach,** Purdue Univ.

**Model-based digital image halftoning using iterative reduced-complexity grid message-passing algorithm,** P. Thiennviboon, TrellisWare Technologies, Inc.; A. Ortega, K. M. Chugg, Univ. of Southern California . . . . . [5008-46]

**Halftoning in the wavelet domain,** M. R. Gupta, K. Berkner, Ricoh California Research Ctr. . . . . [5008-47]

**Halftoning over a hexagonal grid,** P. M. Jodoin, V. Ostromoukhov, Univ. de Montréal (Canada) . . . . . [5008-48]

**Bit-depth extension using spatiotemporal microdither based on models of the equivalent input noise of the visual system,** S. J. Daly, X. Feng, Sharp Labs. of America . . . . . [5008-49]

**Vector color error diffusion by adaptive scan method,** S. C. Lee, Y. T. Kim, Y. H. Cho, Y. H. Ha, Kyungpook National Univ. (Korea) . . . . . [5008-50]

Lunch Break

### SESSION 13 . . . . . Fri. 1:30 to 2:50 pm

**Compression and Data**

*Chair:* **Ping W. Wong,** Consultant

**Compressible halftoning,** P. G. Anderson, C. Liu, Rochester Institute of Technology . . . . . [5008-51]

**Compressible error diffusion,** J. H. Lee, Hewlett-Packard Co.; J. P. Allebach, Purdue Univ. . . . . [5008-52]

**Image barcodes,** N. Damera-Venkata, J. Yen, Hewlett-Packard Labs. . . . . [5008-53]

**Image rendering for digital fax,** G. Feng, Purdue Univ.; M. G. Fuchs, Hewlett Packard Co.; C. A. Bouman, Purdue Univ. . . . . [5008-54]

### SESSION 14 . . . . . Fri. 3:20 to 4:20 pm

**Implementation Issues**

*Chair:* **Reiner Eschbach,** Xerox Corp.

**Incorporating memory constraints in the design of color error diffusion halftoning systems,** N. Damera-Venkata, Hewlett-Packard Labs. . . . . [5008-55]

**Memory efficient error diffusion,** T. Chang, J. P. Allebach, Purdue Univ. . . . [5008-56]

**Practical issues in color inkjet halftoning,** R. L. Levien, artofcode LLC . . . . . [5008-57]

# Conference 5009

Tuesday–Wednesday 21–22 January 2003 • *Proceedings* Vol. 5009

# Visualization and Data Analysis 2003

*Conference Chairs:* **Robert F. Erbacher,** Univ. at Albany; **Philip C. Chen,** Future, Inc.; **Jonathan C. Roberts,** Univ. of Kent at Canterbury (UK); **Matti Gröhn,** Helsinki Univ. of Technology (Finland); **Katy Börner,** Indiana Univ.

*Program Committee:* **Uwe Brinkschulte,** Univ. Karlsruhe (Germany); **L. E. Greenwade,** Idaho National Engineering and Environmental Lab.; **Hans-Georg Pagendarm,** German Aerospace Research Establishment DLR (Germany); **Alex Pang,** Univ. of California/Santa Cruz; **Christopher D. Shaw,** Georgia Institute of Technology; **J. E. Swan II,** Naval Research Lab.; **Craig M. Wittenbrink,** NVIDIA; **Pak C. Wong,** Pacific Northwest National Lab.; **Yingcai Xiao,** Univ. of Akron

## Tuesday 21 January

**SESSION 1 . . . . . Tues. 8:50 to 10:10 am**

### Applications

*Chair:* **Robert F. Erbacher,** Univ. at Albany

**Eigenskies: a method of visualizing weather prediction data,** B. Olsson, A. Ynnerman, R. Lenz, Linköping Univ. (Sweden) . . . . . [5009-01]

**Virtual reconstruction bridges historical knowledge of engineering to the 21st century,** R. Beuthel, R. Anderl, Technische Univ. Darmstadt (Germany) . . . . [5009-02]

**Integration and utilization of different visualization methods and devices in structure-based drug design process,** M. Gröhn, Helsinki Univ. of Technology (Finland); T. Nyrönen, Ctr. for Scientific Computing (Finland) . . . . . [5009-03]

**Three-dimensional laser scanning and reconstruction of ear canal impressions for optimal design of hearing aid shells,** G. Tognola, M. Parazzini, Istituto di Ingegneria Biomedica/CNR (Italy); C. Svelto, Politecnico di Milano (Italy); P. Ravazzani, F. Grandori, CNR (Italy) . . . . . [5009-04]

## Tuesday 21 January

**SESSION 2 . . . . . Tues.10:30 am to 12:10 pm**

### Biomedical Visualiztion

*Chair:* **Jonathan C. Roberts,** Univ. of Kent at Canterbury (UK)

**Lesion identification from scintimammography breast images,** N. Tallapally, R. Sundaram, Gannon Univ.; L. R. Coover, M.D., Hamot Medical Center . . . . . [5009-05]

**Visualizing human fatigue at joint level with the half-joint pair concept,** I. Rodriguez, Univ. de Alcalá (Spain); R. Boulic, Swiss Federal Institute of Technology (Switzerland); D. Meziat, Univ. de Alcalá (Spain) . . . . . [5009-06]

**Tool for metabolic and regulatory pathways visual analysis,** G. Melancon, F. Jourdan, Lab. de Recherche en Informatique, Robotique et Micro-electronique (France) . . . . . [5009-07]

**Classification and retrieving of brain white matter lesions,** S. Han, Huazhong Univ. of Science and Technology (China); T. Jiang, Institute of Automation (China); F. Li, Huazhong Univ. of Science and Technology (China) . . . . . [5009-08]

**Skeleton-based myocardium segmentation,** A. Neubauer, R. Wegenkittl, VRVis Research Ctr. (Austria) . . . . . [5009-09]

Lunch Break

**SESSION 3 . . . . . Tues. 1:30 to 2:10 pm**

### Invited Session I

*Chair:* **Matti Gröhn,** Helsinki Univ. of Technology (Finland)

**Current and future impact of PC graphics cards** *(Invited Paper),* C. M. Wittenbrink, NVIDIA . . . . . [5009-10]

**SESSION 4 . . . . . Tues. 2:20 to 3:20 pm**

### Algorithms

*Chair:* **Matti Gröhn,** Helsinki Univ. of Technology (Finland)

**Approximating time-varying multiresolution data using error-based temporal-spatial reuse,** C. Nuber, Univ. of California/Davis; E. LaMar, Lawrence Livermore National Lab.; B. Hamann, K. I. Joy, Univ. of California/Davis . . . . . [5009-12]

**Normalized-cut algorithm for hierarchical vector field data segmentation,** J. L. Chen, Z. Bai, Univ. of California/Davis; E. W. Bethel, Lawrence Berkeley National Lab.; B. Hamann, Univ. of California/Davis and Lawrence Berkeley National Lab.; T. J. Ligocki, Lawrence Berkeley National Lab. . . . . [5009-13]

**Digital image acquisition and continuous zoom display from multiple-resolution views using heterogeneous image pyramids,** B. L. Tseng, IBM Thomas J. Watson Research Ctr. . . . . [5009-14]

**SESSION 5 . . . . . Tues. 3:40 to 5:00 pm**

### Visualization Techniques

*Chair:* **Robert F. Erbacher,** Univ. at Albany

**Real-time view-dependent extraction of isosurfaces from adaptively refined octrees and tetrahedral meshes,** D. C. Fang, J. T. Gray, B. Hamann, K. I. Joy, Univ. of California/Davis . . . . . [5009-15]

**Texture analysis and scientific visualization,** S. Mavromatis, J. Boo, Univ. de la Mediterranée (France) . . . . . [5009-16]

**Paper landscapes: a visualization design methodology,** R. Brath, Visual Insights, Inc. (Canada) . . . . . [5009-17]

**COM-based framework for management, analysis, and visualization of massive digital elevation models,** Y. Wang, J. Gong, Wuhan Univ. (China) . . . . . [5009-18]

**SESSION 6 . . . . . Tues. 5:00 to 5:40 pm**

### Volume Visualization

*Chair:* **Katy Börner,** Indiana Univ.

**Quantitative image-level evaluation of multiresolution 3D texture-based volume rendering,** K. M. Edlund, Los Alamos National Lab.; T. P. Caudell, Univ. of New Mexico . . . . . [5009-19]

**Accelerated isosurface polygonization for dynamic volume data using programmable graphics hardware,** M. Matsumura, Silicon Studio Corp. (Japan); K. Anjyo, OLM Digital, Inc. (Japan) . . . . . [5009-20]

Order Proceedings now and take advantage of the special prepublication price: $70

*Proceedings V*olume 5009.

*See p. 71 to order.*

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

### SESSION 7 . . . . . Wed. 9:30 to 10:10 am

**Internet and Web Visualizations**

*Chair:* **Katy Börner,** Indiana Univ.

**Visualizing multi-attribute web transactions using a freeze technique,** M. C. Hao, D. Cotting, V. Machiraju, Hewlett-Packard Labs. . . . . [5009-21]

**Analysis and application of node layout algorithms for intrusion detection,** R. F. Erbacher, X. Teng, Univ. at Albany . . . . . [5009-22]

### SESSION 8 . . . . . Wed.10:10 am to Noon

**Algorithms**

*Chair:* **Matti Gröhn,** Helsinki Univ. of Technology (Finland)

**Line and net pattern segmentation using shape modeling,** A. Huang, G. M. Nielson, A. Razdan, G. Farin, D. Capco, P. Baluch, Arizona State Univ. . . . . [5009-23]

**Extracting motion velocities from 3D image sequences and coupled spatio-temporal smoothing,** T. Preusser, M. Rumpf, Duisburg Univ. (Germany) . . . . . [5009-24]

**Automated generalization of soil map,** W. Gao, J. Gong, Wuhan Univ. (China) . . . . . [5009-25]

**Mapping multiresolution texture model for three-dimensional GIS,** B. Yang, Q. Li, Wuhan Univ. (China); W. Shi, Hong Kong Polytechnic Univ. (Hong Kong) . . . [5009-26]

Lunch/Exhibition Break

### SESSION 9 . . . . . Wed. 1:30 to 2:10 pm

**Invited Session II**

*Chair:* **Jonathan C. Roberts,** Univ. of Kent at Canterbury (UK)

**Visualizing knowledge domains** *(Invited Paper),* K. Börner, Indiana Univ. . [5009-27]

### SESSION 10 . . . . . Wed. 2:20 to 3:00 pm

**Interaction**

*Chair:* **Katy Börner,** Indiana Univ.

**Audio-visual situational awareness for general aviation pilots,** L. Spirkovska, NASA Ames Research Ctr.; S. K. Lodha, Univ. of California/Santa Cruz . . . . . [5009-29]

**Enabling multi-purpose image interaction in modular visualization environments,** F. Chatzinikos, H. Wright, Univ. of Hull (UK) . . . . . [5009-30]

### SESSION 11 . . . . . Wed. 3:20 to 4:00 pm

**Large Scale Data Visualization**

*Chair:* **Jonathan C. Roberts,** Univ. of Kent at Canterbury (UK)

**Multiple foci and context approach to large hierarchy visualization,** H. Song, E. P. Curran, R. Sterritt, Univ. of Ulster at Jordanstown (UK) . . . . . [5009-31]

**LOD-based clustering techniques for efficient large-scale terrain storage and visualization,** X. Bao, R. Pajarola, Univ. of California/Irvine . . . . . [5009-32]

### SESSION 12 . . . . . Wed. 4:10 to 5:30 pm

**Scientific Visualization**

*Chair:* **Robert F. Erbacher,** Univ. at Albany

**Visual identification of structure in four-dimensional data,** R. R. Johnson, R. Millar, I. Ben, nDV-LLC . . . . . [5009-33]

**Marsoweb: a collaborative web facility for Mars landing site and global data studies,** G. Deardorff, V. C. Gulick, NASA Ames Research Ctr. . . . . [5009-34]

**Visualizing realistic 3D urban environments,** A. Lee, T. Chen, M. Bruenig, H. Schmidt, Robert Bosch Corp. . . . . [5009-35]

**Visualization of experimental earthquake data,** G. H. Weber, Univ. Kaiserslautern (Germany) and Univ. of California/Davis (Germany); M. Schneider, Univ. Kaiserslautern (Germany); D. W. Wilson, Univ. of California/Davis; H. Hagen, Univ. Kaiserslautern (Germany); B. Hamann, B. Kutter, Univ. of California/Davis [5009-36]

**✔ Posters–Wednesday**

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

✔ **Scientific visualization in structure analysis,** L. Zhong, J. Yuan, J. Chen, Wuhan Univ. of Technology (China) . . . . . [5009-37]

✔ **Symplectic ray-tracing: a new approach for non-linear ray-tracings by Hamiltonian dynamics,** T. R. Satoh, Keihanna Human Info-Communication Research Lab. (Japan) . . . . . [5009-38]

✔ **Automatic traffic real-time analysis system based on video,** L. Ding, J. Liu, Zhejiang Univ. (China) . . . . . [5009-39]

✔ **StudyDesk: interactive data analysis and scientific visualization in a semi-immersive environment,** L. M. Encarnacao, P. Branco, P. Stephenson, J. Tesch, D. L. Zeltzer, Fraunhofer Ctr. for Research in Computer Graphics . . . . . [5009-40]

✔ **VRML visualization system of the Castelo de Vide aquifer and interaction with Sever river,** L. Ribeiro, C. Tavares Ribeiro, J. Paulo Monteiro, S. Amaro, Instituto Superior Tecnico (Portugal) . . . . . [5009-41]

✔ **INSPECT: a dynamic visual query system for geospatial information exploration,** J. K. Hahn, The George Washington Univ.; S. Lee, The George Washington Univ. and Boeing Co.; A. M. Powell, Jr., G. Greene, Boeing Co. . . . . [5009-42]

✔ **Dynamic approach for efficient remote interactive visualization,** D. S. Liu, C. H. Kuo, C. J. Shiu, National Chung Cheng Univ. (Taiwan) . . . . . [5009-43]

✔ **Large-scale parallel volume rendering using the data flow paradigm,** G. Knittel, Eberhard-Karls-Univ. Tübingen (Germany) . . . . . [5009-44]

✔ **Faster technique for rendering meshes in multiple display systems,** R. Hand, R. J. Moorhead II, Mississippi State Univ. . . . . [5009-45]

Order Proceedings now and take advantage of the special prepublication price: $70

*Proceedings V*olume 5009.

*See p. 71 to order.*

# Conference 5010

Thursday–Friday 23–24 January 2003 • *Proceedings* Vol. 5010

# Document Recognition and Retrieval X

*Conference Chairs:* **Tapas Kanungo,** IBM Almaden Research Ctr.; **Elisa H. Barney Smith,** Boise State Univ.; **Jianying Hu,** Avaya Labs. Research; **Paul B. Kantor,** Rutgers Univ.

*Program Committee:* **Jamie Callan,** Carnegie Mellon Univ.; **Francine R. Chen,** Palo Alto Research Ctr.; **David S. Doermann,** Univ. of Maryland/College Park; **Hiromichi Fujisawa,** Hitachi, Ltd. (Japan); **David Grossman,** Illinois Institute of Technology; **Alexander Hauptmann,** Carnegie Mellon Univ.; **Jonathan J. Hull,** Ricoh Corp. California Research Ctr.; **Matthew Hurst,** Whizbang!Labs Inc.; **Daniel P. Lopresti,** Lucent Technologies/Bell Labs.; **Kris Popat,** Palo Alto Research Ctr.; **Sargur N. Srihari,** Univ. at Buffalo; **Kazem Taghva,** Univ. of Nevada/Las Vegas; **George R. Thoma,** National Library of Medicine; **Marcel Worring,** Univ. van Amsterdam (Netherlands); **Jiangying Zhou,** Summus Ltd.

## Wednesday 22 January

### ✔ Posters–Wednesday

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

✔ **Fermat theorem and elliptic color histogram features,** A. Malizia, L. Cinque, S. Levialdi, Univ. degli Studi di Roma La Sapienza (Italy) . . . . . [5010-31]

✔ **Automatic information retrieval of Chinese business card,** G. Shi, W. Pan, J. Jin, Nankai Univ. (China) . . . . . [5010-32]

✔ **Text location in color documents,** A. K. Jain, A. M. Namboodiri, K. Jung, Michigan State Univ. . . . . [5010-33]

✔ **General Chinese document capture system with an improved error-rejecting module,** D. Luan, C. Liu, X. Ding, Tsinghua Univ. (China) . . . . . [5010-34]

✔ **Semantic-based image retrieval by text mining on environmental texts,** H. C. Yang, C. H. Lee, Chang Jung Univ. (Taiwan) . . . . . [5010-35]

✔ **Separation algorithm of superimposed pattern using directional decomposition of an image,** M. Suwa, S. Naoi, Fujitsu Labs. Ltd. (Japan) . . . . . [5010-36]

✔ **Domain-oriented information extraction from the Internet,** A. Arens, K. H. Blaesius, Fachhochschule Trier (Germany) . . . . . [5010-37]

✔ **Distortion analysis and rectification of document images,** A. Zandifar, N. Gumerov, R. Duriswami, L. S. Davis, Univ. of Maryland/College Park . . . . . [5010-38]

✔ **Morphological postal envelope segmentation by co-occurrence matrix,** J. Facon, E. A. Yonekura, Pontificia Univ. Católica do Paraná (Brazil) . . . . . [5010-39]

✔ **Psychophysics of reading and human interactive proofs,** M. Chew, Univ. of California/Berkeley; H. S. Baird, Xerox Palo Alto Research Ctr. . . . . [5010-40]

✔ **Graphics extraction in PDF document,** H. Chao, Hewlett Packard Co. . . . [5010-41]

## Thursday 23 January

**Plenary Speaker . . . . . Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

**SESSION 1 . . . . . Thurs. 9:30 to 10:30 am**

**Invited Paper**

**TBD** *(Invited Paper),* . . . . . [5010-01]

**SESSION 2 . . . . . Thurs.11:00 am to Noon**

**Optical Character Recognition I**

**Text extraction via an edge-bounded averaging and a parametric character model,** J. Fan, Hewlett-Packard Labs. . . . . [5010-02]

**Geostatistical features, fuzzy partition, and neural networks for logo recognition,** T. Pham, Defence Science and Technology Organisation (Australia) . . . . . [5010-03]

**Handwriting shape matching using microfeatures,** B. Zhang, S. N. Srihari, Univ. at Buffalo . . . . . [5010-04]

Lunch/Exhibition Break

**SESSION 3 . . . . . Thurs. 2:00 to 3:00 pm**

**Optical Character Recognition II**

**AdaBoost-based handwritten/printed discrimination on single character,** H. Liu, X. Ding, C. Fang, Tsinghua Univ. (China) . . . . . [5010-05]

**Automated labeling of bibliographic data extracted from biomedical online journals,** J. Kim, D. X. Le, G. R. Thoma, National Library of Medicine . . . . . [5010-06]

**Syntax-directed content analysis of video: application to a map detection recognition system,** H. Aradhye, J. A. Herson, G. Myers, SRI International . [5010-07]

**SESSION 4 . . . . . Thurs. 3:20 to 5:00 pm**

**Modeling and Error Analysis**

**Extraction of valid data sets in registers using recognition of invalidation lines,** G. Maderlechner, P. Suda, Siemens AG (Germany) . . . . . [5010-08]

**Document image improvment for OCR as a classification problem,** K. M. Summers, Vredenburg . . . . . [5010-09]

**Correcting OCR text by association with historical datasets,** S. E. Hauser, J. Schlaifer, T. F. Sabir, D. Demner-Fushman, S. Straughan, G. R. Thoma, National Library of Medicine . . . . . [5010-10]

**Speed-up of optical scanner characterization subsystem,** R. Clements, E. H. Barney Smith, Boise State Univ. . . . . [5010-11]

**OCR correction based on document level knowledge,** T. A. Nartker, K. Taghva, R. Young, J. Borsack, A. Condit, Univ. of Nevada/Las Vegas . . . . . [5010-12]

# Conference 5010

## Friday 24 January

### SESSION 5 ..... Fri. 8:30 to 9:30 am

#### Invited Speaker

**TBD** *(Invited Paper),* ..... [5010-13]

### SESSION 6 ..... Fri. 9:30 am to Noon

#### Information Retrieval

**Do Thesauri enhance rule-based categorization for OCR text?**, K. Taghva, J. Coombs, Univ. of Nevada/Las Vegas ..... [5010-14]

**Exploring a hybrid of support vector machines (SVMs) and a heuristic-based system in classifying web pages,** A. F. R. Rahman, H. Alam, Y. Tarnikova, BCL Technologies Inc. ..... [5010-15]

**Information retrieval for OCR documents: a content-based probabilistic correction model,** R. Jin, C. Zhai, A. Hauptmann, Carnegie Mellon Univ. ..... [5010-16]

**Categorizing images in web documents,** J. Hu, A. Bagga, Avaya Labs. Research ..... [5010-17]

**Resource-optimized delivery of web images to small-screen devices,** Y. Wu, Princeton Univ.; D. P. Lopresti, Lucent Technologies/Bell Labs. ..... [5010-18]

**Similarity-based matching method for handwriting retrieval,** K. Sun, Institute of Computational Mathematics and Scientific/Engineering Computing (China); J. Wang, Microsoft Research Asia (China) ..... [5010-19]

Lunch Break

### SESSION 7 ..... Fri. 1:30 to 3:30 pm

#### Layout Analysis

**Header and footer extraction by page association,** X. Lin, Hewlett-Packard Labs. ..... [5010-20]

**Unconstrained invoice processing in the health insurance domain,** M. Hurst, Consultant; D. Barney, Consultant ..... [5010-21]

**Bootstrapping structured page segmentation,** H. Ma, D. S. Doermann, Univ. of Maryland/College Park ..... [5010-22]

**Content features for logical document labeling,** J. Liang, D. S. Doermann, Univ. of Maryland/College Park ..... [5010-23]

**Document structure analysis algorithms: a literature survey,** S. Mao, A. Rosenfeld, Univ. of Maryland/College Park; T. Kanungo, IBM Almaden Research Ctr. .. [5010-24]

**Form type identification for banking applications and its implementation issues,** H. Ogata, S. Watanabe, A. Imaizumi, T. Yasue, H. Fujisawa, Hitachi, Ltd. (Japan)[5010-25]

### SESSION 8 ..... Fri. 4:00 to 5:40 pm

#### Multilingual OCR

**Radiant-projection transformation (RPT) and its applications in Chinese character recognition,** N. Sun, M. Cao, Shandong Univ. of Science and Technology (China) ..... [5010-26]

**Optical font recognition of single Chinese character,** L. Chen, X. Ding, Tsinghua Univ. (China) ..... [5010-27]

**Efficient digitalizing scheme of handwritten documents in oriental languages,** H. K. Kwag, S. T. Kim, S. H. Ryu, J. H. Kim, Korea Advanced Institute of Science and Technology (Korea) ..... [5010-28]

**Turkish text recognition: a case of agglutinative languages,** B. A. Yanikoglu, A. Kholmatov, Sabanci Univ. (Turkey) ..... [5010-29]

**Structural feature-based approach for script identification of Gurmukhi and Roman characters and words,** G. S. Lehal, Thapar Institute of Engineering and Technology (India); C. Singh, Punjabi Univ. (India); R. Dhir, Regional Engineering College (India) ..... [5010-30]

Order Proceedings now and take advantage of the special prepublication price: $70

*Proceedings V*olume 5010 will be available onsite.

*See p. 71 to order.*

**Register by 20 December 2002 and save US $100!**

**Register online!**

# Conference 5011

Thursday–Friday 23–24 January 2003 • *Proceedings* Vol. 5011

# Machine Vision Applications in Industrial Inspection XI

*Conference Chairs:* **Martin A. Hunt,** nLine Corp.; **Jeffery R. Price,** Oak Ridge National Lab.

*Program Committee:* **Zachi Z. Baharav,** Agilent Technologies Labs.; **Ariel Ben-Porath,** Applied Materials, Inc. (Israel); **Steven P. Floeder,** 3M Co.; **J. Birgitta Martinkauppi,** Univ. of Oulu (Finland); **Fabrice Meriaudeau,** Univ. de Bourgogne (France); **Majid Mirmehdi,** Univ. of Bristol (UK); **Paul O'Leary,** Montanuniv. Leoben (Austria); **A. Ravishankar Rao,** IBM Thomas J. Watson Research Ctr.; **Hamed Sari-Sarraf,** Texas Tech Univ.; **Kenneth W. Tobin, Jr.,** Oak Ridge National Lab.

## Wednesday 22 January

### ✔ Posters–Wednesday

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

✔ **Neural network based inspection of ball grid array solder joints by a new tomosynthesis system,** S. T. Kang, Yanbian Univ. of Science and Technology (China) . . . . . [5011-34]

✔ **Skeletonization based on symmetric point pairs sequence and its application,** X. Li, Y. Zhang, Southern Yangtze Univ. (China) . . . . . [5011-35]

✔ **Estimation of electron beam profile from SEM image by using wavelet multiresolution analysis,** M. Chikahisa, K. Nakamae, H. Fujioka, Osaka Univ. (Japan) . . . . . [5011-36]

✔ **Temperature mapping in a heat treatment process with standard color-video camera by means of image processing,** G. Zauner, D. Heim, G. Hendorfer, Fachhochschule Wels (Austria) . . . . . [5011-37]

✔ **Camera calibration technique with planar scenes,** Y. Zhang, Z. Zhang, Wuhan Univ. (China) . . . . . [5011-38]

✔ **Automatic detection system for random defects on strongly reflective and complex surface,** X. Qu, Y. He, X. Zhao, S. Ye, Tianjin Univ. (China) . . . . . [5011-39]

✔ **Automated visual inspection for polished stone manufacture,** M. L. Smith, L. N. Smith, Univ. of the West of England (UK) . . . . . [5011-40]

✔ **Stereo vision technology for object measurement,** L. N. Smith, M. L. Smith, Univ. of the West of England (UK) . . . . . [5011-41]

✔ **Automatic acquisition of object using appearance model,** F. Biswas, H. Nagase, Kyushu Institute of Technology (Japan) . . . . . [5011-42]

## Thursday 23 January

**Plenary Speaker . . . . . Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

**SESSION 1 . . . . . Thurs. 9:30 to 10:30 am**

**3D**

*Chair:* **Martin A. Hunt,** nLine Corp.

**Three-dimensional shape measurement for mechanical parts based on the wavelet and neural network in neuro-vision system,** Y. Xiong, F. K. H. Quek, Wright State Univ. . . . . [5011-01]

**Boundary extraction in reverse engineering using trinocular stereo vision,** Z. Lin, B. He, Xi'an Jiao Tong Univ. (China) . . . . . [5011-02]

**Accurate surface reconstruction of large 3D objects from range data,** X. Li, L. He, B. Everding, C. Y. Han, W. G. Wee, Univ. of Cincinnati . . . . . [5011-03]

**SESSION 2 . . . . . Thurs.11:00 am to Noon**

**Industrial Inspection I**

*Chair:* **Jeffery R. Price,** Oak Ridge National Lab.

**Distributed image processing system for the monitoring of hot rolled steel wire,** P. O'Leary, A. Schiller, M. Weiss, Univ. of Leoben (Austria) . . . . . [5011-04]

**Identification of white contaminants and their removal from wool fibers,** L. Zhang, A. Dehghani, Z. Su, T. King, B. Greenwood, Leeds Univ. (UK) . . . . . [5011-05]

**Vision system for auto-detection and classification of cashmere pigmented fibers,** Z. Su, A. Dehghani, L. Zhang, T. King, B. Greenwood, Leeds Univ. (UK) . . . . . [5011-06]

Lunch/Exhibition Break

**SESSION 3 . . . . . Thurs. 1:30 to 3:10 pm**

**Industrial Inspection II**

*Chair:* **Fabrice Meriaudeau,** Univ. de Bourgogne (France)

**Primary detection of hardwood log defects using laser surface scanning,** L. Thomas, R. W. Ehrich, L. Mili, Virginia Polytechnic Institute and State Univ.; E. Thomas, U.S. Dept. of Agriculture Forest Service . . . . . [5011-07]

**Tunnel profile measurement by vision metrology toward application to NATM,** S. Hattori, Fukuyama Univ. (Japan); K. Akimoto, Shikoku Polytechnic Univ. (Japan); S. Miura, Kajima Technical Research Institute (Japan); T. Ono, Kyoto Univ. (Japan) . . . . . [5011-08]

**Calibration verification of a mining machine using image processing,** P. O'Leary, R. Ofner, G. Rath, Montanuniv. Leoben (Austria) . . . . . [5011-09]

**Relief reconstruction of roughness textured surface through image analysis,** A. Benslimane, M. Khoudeir, J. Brochard, Univ. de Poitiers (France); V. Legeay, M. T. Do, Lab. Central des Ponts et Chaussées (France) . . . . . [5011-10]

**Shape description and analysis of range data for milled steel blocks,** F. Pernkopf, P. O'Leary, Montanuniv. Leoben (Austria) . . . . . [5011-11]

**SESSION 4 . . . . . Thurs. 3:40 to 5:20 pm**

**Industrial Inspection III**

*Chair:* **Paul O'Leary,** Montanuniv. Leoben (Austria)

**Machine vision technique for measuring glass container thickness,** R. M. Ford, J. A. Mercier, The Pennsylvania State Univ. . . . . [5011-12]

**Computer vision-based gob inspection system for monitoring and control in the glass industry,** A. R. Jimenez Ruiz, E. Laizola, F. Morgado, M. Calvache, J. L. Pons, Instituto de Automatica Industrial (Spain) . . . . . [5011-13]

**Classical imaging and digital imaging spectrophotometric techniques in cullets (glass fragments) sorting,** G. Bonifazi, P. Massacci, Univ. degli Studi di Roma La Sapienza (Italy) . . . . . [5011-14]

**Development of a strain analyzer system for sheet metal stamped parts based on an optical 3D digitizer,** E. Carasusán, F. Canal Bienzobas, Univ. Politecnica de Catalunya (Spain) . . . . . [5011-15]

**Automated serial number recognition system,** H. Wang, X. Bao, L. Luo, Southeast Univ. (China); G. Lu, Hefei Univ. of Technology (China) . . . . . [5011-16]

## Friday 24 January

### SESSION 5 ..... Fri. 8:30 to 10:10 am

**Pattern Recognition I**

*Chair:* **Zachi Z. Baharav,** Agilent Technologies Labs.

**Hybrid machine vision method for autonomous guided vehicles,** J. Lu, National Institute of Industrial Safety (Japan) ..... [5011-17]

**Three-color selective stereo gradient method (3CSSGM) for fast topography recognition,** M. Adameck, M. Hossfeld, M. Eich, Technische Univ. Hamburg-Harburg (Germany) ..... [5011-18]

**Using high-speed camera to discriminate projective line with an adverse illumination,** T. Sliwa, Y. Voisin, A. Diou, Univ. de Bourgogne (France) ..... [5011-19]

**Comparative evaluation of classifiers and feature selection for automatic defect classification,** P. Gupta, D. S. Doermann, D. DeMenthon, Univ. of Maryland/College Park ..... [5011-20]

**Classification of painting cracks for content-based analysis,** F. Salleh Abas, K. Martinez, Univ. of Southampton (UK) ..... [5011-21]

### SESSION 6 ..... Fri.10:30 am to 12:10 pm

**Pattern Recognition II**

*Chair:* **Jeffery R. Price,** Oak Ridge National Lab.

**Estimating cross-section semiconductor structure by comparing top-down SEM images,** J. R. Price, P. R. Bingham, K. W. Tobin, Jr., T. P. Karnowski, Oak Ridge National Lab. ..... [5011-22]

**Effect of acquisition system features on algorithm performance,** V. Venkatachalam, R. M. Wasserman, Micro Encoder, Inc. ..... [5011-23]

**Content-based segmentation of patterned wafers,** P. Bourgeat, Oak Ridge National Lab. (USA) and Univ. de Bourgogne (France); F. Meriaudeau, P. Gorria, Univ. de Bourgogne (France); K. W. Tobin, Jr., Oak Ridge National Lab. ..... [5011-24]

**Fine structure measurement in the SEM cross section of LSI using the Canny edge detector,** Y. Midoh, K. Miura, K. Nakamae, H. Fujioka, Osaka Univ. (Japan) . [5011-25]

**Comprehensive investigation of sub-pixel edge detection schemes in metrology,** V. Venkatachalam, R. M. Wasserman, Micro Encoder, Inc. ..... [5011-26]

Lunch Break

### SESSION 7 ..... Fri. 1:30 to 3:10 pm

**Registration/Multispectral**

*Chair:* **Paul O'Leary,** Montanuniv. Leoben (Austria)

**Automated image registration in semiconductor industry: a case study in the DDH inspection systems,** X. L. Dai, M. A. Hunt, M. A. Schulze, C. E. Thomas, Jr., nLine Corp. ..... [5011-27]

**Registration of range images under different viewpoints,** K. N. Chen, L. Feng, Z. H. Lin, Xi'an Jiao Tong Univ. (China) ..... [5011-28]

**NIR spectrophotometric system based on a conventional CCD camera,** M. Vilaseca, J. Pujol, M. Arjona, Univ. Politecnica de Catalunya (Spain) ..... [5011-29]

**Real-time multispectral high-temperature measurement: application to control in the industry,** F. Meriaudeau, A. C. Legrand, P. Gorria, Univ. de Bourgogne (France) ..... [5011-30]

**Ornamental stone finished product aesthetic inspection and characterization through a combined digital spectrophotometric and imaging based approach,** G. Bonifazi, Univ. degli Studi di Roma La Sapienza (Italy) ..... [5011-31]

### SESSION 8 ..... Fri. 3:30 to 4:10 pm

**Interferometry**

*Chair:* **Fabrice Meriaudeau,** Univ. de Bourgogne (France)

**Dynamic classification of fringe patterns in holographic interferometry by optical wavelet filtering,** F. Kallmeyer, S. Krueger, G. K. Wernicke, H. Gruber, Humboldt-Univ. zu Berlin (Germany); W. Osten, D. Kayser, Bremer Institut für Angewandte Strahltechnik (Germany) ..... [5011-32]

**Determination of speckle fringe orientation map by image sequence and removing the speckle noise from speckle fringe patterns,** Q. Yu, X. Sun, National Univ. of Defense Technology (China) ..... [5011-33]

Order Proceedings now and take advantage of the special prepublication price: $70

*Proceedings V*olume 5011.

*See p. 71 to order.*

# Conference 5012

Thursday 23 January 2003 • *Proceedings* Vol. 5012

# Real-Time Imaging VII

*Conference Chairs:* **Nasser Kehtarnavaz,** Univ. of Texas/Dallas; **Phillip A. Laplante,** The Pennsylvania State Univ.

*Program Committee:* **Alberto Broggi,** Univ. di Parma (Italy); **Matthias F. Carlsohn,** Computer Vision and Image Communication (Germany); **Luciano da Fontoura Costa,** Univ. de São Paulo (Brazil); **Edward R. Dougherty,** Texas A&M Univ.; **Colin Neill,** The Pennsylvania State Univ.; **Amos Omondi,** Nanyang Technological Univ. (Singapore); **Divyendu Sinha,** Eastman Kodak Co.; **Purnendu Sinha,** Concordia Univ. (Canada); **Moira I. Smith,** Waterfall Solutions Ltd. (UK); **Cesar Torres-Huitzil,** Instituto Nacional de Astrofísica Óptica y Electrónica (Mexico); **Youngjun F. Yoo,** Texas Instruments Inc.

## Wednesday 22 January

### ✔ Posters–Wednesday

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

✔ **Novel data acquisition and communication bus architecture for real-time multisensor imaging systems,** J. Brodersen, K. Mayer, D. Landl, I. Bajla, ARC Seibersdorf Research GmbH (Austria) . . . . . [5012-18]

✔ **Novel development tool for software pipeline optimization for VLIW-DSPs used in real-time image processing,** J. Fuertler, K. Mayer, W. Krattenthaler, I. Bajla, ARC Seibersdorf Research GmbH (Austria) . . . . . [5012-19]

✔ **Real-time night vision image processing based on TMS320C6201 DSP hardware and software,** C. Liao, J. Zhang, Harbin Institute of Technology (China) . [5012-20]

✔ **Active dynamic deformatble template matching for pattern recognition in real time,** X. An, W. Chang, H. He, National Univ. of Defense Technology (China) . . . . . [5012-21]

✔ **Detection of corrosion beneath thick paint layer using mid-infrared scanning imaging technique,** J. Zeylikovich, W. B. Wang, F. Zeng, J. H. Ali, B. Yu, R. R. Alfano, CUNY/City College; V. Benischek, Lockheed Martin Co. . . . . [5012-22]

## Thursday 23 January

**Plenary Speaker . . . . . Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

**SESSION 1 . . . . . Thurs. 9:30 to 9:30 am**

**Surveillance Systems**

*Chair:* **Aishy Amer,** Univ. du Québec (Canada)

**Real-time video surveillance system using omni-directional image sensor and controllable camera,** M. Doi, Y. Aoki, Osaka Electro-Communication Univ. (Japan) . . . . . [5012-01]

**Memory-based spatio-temporal real-time object segmentation for video surveillance,** A. Amer, Univ. du Québec (Canada); E. Dubois, Univ. of Ottawa (Canada); A. Mitiche, Univ. du Québec (Canada) . . . . . [5012-02]

**Statistical modeling of active vision systems for real-time video surveillance,** V. V. Belov, Institute of Atmospheric Optics (Russia) . . . . . [5012-03]

**SESSION 2 . . . . . Thurs.11:00 am to Noon**

**Algorithms**

*Chair:* **Volodymyr I. Ponomaryov,** Instituto Politecnico Nacional (Mexico)

**Class of Kalman filters for real-time image processing,** P. A. Laplante, C. Neill, The Pennsylvania State Univ. . . . . [5012-04]

**Distance-invariant object recognition in office environments by real-time vision,** M. C. Nguyen, Technische Univ. München (Germany) . . . . . [5012-05]

**Real-time processing scheme based on RM estimators,** V. I. Ponomaryov, F. J. Gallegos-Funes, L. Nino-deRivera, F. Gomertagle-Sepulveda, Instituto Politecnico Nacional (Mexico) . . . . . [5012-06]

Lunch/Exhibition Break

**SESSION 3 . . . . . Thurs. 1:30 to 3:10 pm**

**Video**

*Chair:* **A. Saparon,** Loughborough Univ. (UK)

**Taxonomy of an XML-based metadata in a real-time digiTV deployment environment,** A. R. Lugmayr, S. Kalli, Tampere Univ. of Technology (Finland) . . . . . [5012-07]

**Implementation of a nonlinear gradient adaptive filter for processing of large-size medical sequences on general-purpose hardware,** K. Eck, H. Fillbrandt, G. Kiefer, Philips GmbH (Germany); T. Aach, Univ. zu Lübeck (Germany) . . . . . [5012-08]

**Real-time stereo video from MPEG video,** I. A. Ideses, L. P. Yaroslavsky, Tel Aviv Univ. (Israel) . . . . . [5012-09]

**Novel scanning order for fast elimination of candidate predictors in MPEG-2 block-based motion estimation,** A. Saparon, C. Grecos, S. R. Jones, Loughborough Univ. (UK) . . . . . [5012-10]

**SESSION 4 . . . . . Thurs. 3:20 to 5:20 pm**

**Architectures and Systems**

*Chair:* **G. Knowles,** Flinders Univ. (Australia)

**Dedicated architecture for topological operators for gray image processing,** M. Akil, Groupe ESIEE (France) . . . . . [5012-12]

**High-performance architecture for color error diffusion,** A. E. Savakis, Rochester Institute of Technology; C. R. Brown, Microwave Data Systems Inc. . . . . [5012-13]

**System on chip approach for a SIMD architecture dedicated to 2D and 3D image processing,** D. Dulac, J. Denoulet, Groupe ESIEE (France) . . . . . [5012-14]

**Real-time hardware architectures for the bi-orthogonal wavelet transform,** G. Knowles, Flinders Univ. (Australia) . . . . . [5012-15]

**Real-time range sensing with a Scheimpflug camera and a single custom sensor/processor chip,** U. Cilingiroglu, Texas A&M Univ.; E. Cilingiroglu, Isik Univ. (Turkey); S. Chen, Texas A&M Univ.; B. S. Yarman, Isik Univ. (Turkey) . . . . . [5012-16]

**Real-time industrial safety monitoring system,** R. Hamza, D. Cofer, Honeywell International . . . . . [5012-17]

Order Proceedings now and take advantage of the special prepublication price: $53

*Proceedings V*olume 5013 will be available onsite.

*See p. 71 to order.*

# Conference 5013

Tuesday–Wednesday 21–22 January 2003 • *Proceedings* Vol. 5013

# Videometrics VII

*In cooperation with:* isprs

*Conference Chairs:* **Sabry F. El-Hakim,** National Research Council Canada; **Armin Gruen,** Swiss Federal Institute of Technology (Switzerland); **James S. Walton,** 4D Video

*Program Committee:* **David P. Chapman,** Univ. College London (UK); **Hirofumi Chikatsu,** Tokyo Denki Univ. (Japan); **Dieter Fritsch,** Univ. Stuttgart (Germany); **Joao G. Goncalves,** European Commission/Joint Research Ctr. (Italy); **Henrik G. Haggren,** Helsinki Univ. of Technology (Finland); **Sing Bing Kang,** Microsoft Corp.; **George E. Karras,** Technical Univ. of Athens (Greece); **Hans-Gerd Maas,** Technische Univ. Dresden (Germany); **Mark R. Shortis,** Univ. of Melbourne (Australia); **Luc J. Van Gool,** Swiss Federal Institute of Technology (Switzerland) and Katholieke Univ. Leuven (Belgium)

## Tuesday 21 January

### SESSION 1 . . . . . Tues. 8:10 to 10:05 am

#### Dynamic and Immersive Virtual Environments

**Tele-immersive system based on binocular view interpolation** *(Invited Paper),* P. Boulanger, Univ. of Alberta (Canada); W. Wong, Univ. of Ottawa (Canada) . [5013-01]

**Real-time distributed 3D model recovery from image sequences,** M. Sainz, N. Bagherzadeh, F. Kuester, Univ. of California/Irvine . . . . . [5013-02]

**Automatic creation of three-dimensional avatars,** M. Villa-Uriol, M. Sainz, F. Kuester, N. Bagherzadeh, Univ. of California/Irvine . . . . . [5013-03]

**High-speed active 3D acquisition based on a pattern-specific mesh,** T. Koninckx, L. J. Van Gool, Katholieke Univ. Leuven (Belgium) . . . . . [5013-04]

### SESSION 2 . . . . . Tues.10:30 am to 12:10 pm

#### Body and Face Modeling and Animation

**Three-dimensional reconstruction and modeling of human body with a digital camera,** F. Remondino, ETH Zurich (Switzerland) . . . . . [5013-05]

**Visual speech generator,** G. A. Kalberer, P. Müller, ETH Zürich (Switzerland); L. J. Van Gool, ETH Zürich and Katholieke Univ. Leuven (Belgium) . . . . . [5013-06]

**Human body motion capture from multi-image video sequences,** N. D'Apuzzo, ETH Zürich (Switzerland) . . . . . [5013-07]

**Effective human extraction for motion analysis by hybrid video theodolite,** T. Anai, H. Chikatsu, Tokyo Denki Univ. (Japan) . . . . . [5013-08]

Lunch Break

### SESSION 3 . . . . . Tues. 1:30 to 3:00 pm

#### Range Sensing and Modeling

**Review of 20 years of range sensor development** *(Invited Paper),* F. Blais, National Research Council Canada . . . . . [5013-09]

**Voxel-based method for fine registration of multiple range images,** I. S. Okatani, H. Maekawa, Saitama Univ. (Japan) . . . . . [5013-10]

**Automated interpretation of dense range data,** J. Boehm, Univ. Stuttgart (Germany) . . . . . [5013-11]

### SESSION 4 . . . . . Tues. 3:30 to 5:25 pm

#### 3D Measurement and Inspection Techniques

**Online, offline, realtime: recent developments in industrial photogrammetry** *(Invited Paper),* W. Boesemann, AICON 3D Systems GmbH (Germany) . . . . . [5013-12]

**Surface orientation imager using three-phase amplitude-modulated illumination and correlation image sensor,** T. Kurihara, M. Ohira, T. Shimizu, N. Ono, S. Ando, Univ. of Tokyo (Japan) . . . . . [5013-13]

**Optical triangulation technique for height measurements on water surfaces,** H. Maas, F. Schreiber, Technische Univ. Dresden (Germany); B. Hentschel, Bundesanstalt für Wasserbau (Germany) . . . . . [5013-14]

**Optical 3D coordinate measurement using a range sensor and photogrametry,** J. Peipe, Univ. der Bundeswehr München (Germany); P. Andrae, Steinbichler Optotechnik GmbH (Germany) . . . . . [5013-15]

Order Proceedings now and take advantage of the special prepublication price: $60

*Proceedings V*olume 5013 will be available onsite.

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

### SESSION 5 . . . . . Wed. 9:30 to 10:35 am

#### Capturing Reality

**Modeling from reality: creating virtual reality models through observation** *(Invited Paper),* K. Ikeuchi, A. Nakazawa, K. Nishino, R. Sagawa, T. Oishi, Univ. of Tokyo (Japan) . . . . . [5013-16]

**Image-based reconstruction of the Great Buddha of Bamiyan, Afghanistan,** A. Gruen, F. Remondino, L. Zhang, ETH Zürich (Switzerland) . . . . . [5013-17]

### SESSION 6 . . . . . Wed.11:00 am to 12:15 pm

#### Virtual Culture Heritage

**Virtualization, virtual environments, and content-based retrieval of three-dimensional information for cultural applications,** E. Paquet, S. Peters, J. A. Beraldin, National Research Council Canada; V. Valzano, A. Bandiera, Univ. degli Studi di Lecce (Italy) . . . . . [5013-18]

**Carpiniana: a virtualized Byzantine crypt,** J. A. Beraldin, M. Picard, S. F. El-Hakim, G. Godin, V. Valzano, A. Bandiera, National Research Council Canada . . . . . [5013-19]

**Research of tridimensional survey and three-dimensional visualization of grand joss,** Y. Zhu, X. Ning, J. Li, H. Li, Wuhan Univ. (China) . . . . . [5013-20]

Lunch/Exhibition Break

### SESSION 7 . . . . . Wed. 1:30 to 3:10 pm

#### Pose Estimation, Calibration, and Registration Techniques

**Pose estimation, registration, and integration for complete 3D model reconstruction,** S. Y. Park, M. Subbarao, Stony Brook Univ. . . . . [5013-21]

**Novel closed form solution to a single photo-resection in a planar object space,** G. H. Seedahmed, The Ohio State Univ. and Pacific Northwest National Lab. . . . [5013-22]

**Pose detection of cameras in real time,** J. Ramos-Cózar, N. Guil-Mata, E. López-Zapata, Univ. de Málaga (Spain) . . . . . [5013-23]

**Registration of motion imagery scenes to urban virtual models,** A. Stefanidis, P. Agouris, C. Georgiadis, Univ. of Maine . . . . . [5013-24]

### SESSION 8 . . . . . Wed. 3:30 to 5:10 pm

#### Recognition, Matching, and Modeling Techniques

**Building extraction and modeling in urban area by image sequence analysis,** Y. Kunii, H. Chikatsu, Tokyo Denki Univ. (Japan) . . . . . [5013-25]

**Spatial subdivision for piecewise planar object reconstruction,** K. Schindler, Technische Univ. Graz (Austria) . . . . . [5013-26]

**Automatic recognition of coded targets based on a Hough transform and segment matching,** M. R. Shortis, J. W. Seager, Univ. of Melbourne (Australia); S. Robson, Univ. College London (UK); E. S. Harvey, Univ. of Western Australia . . . . . [5013-27]

**Digital surface models for the estimation of hydraulic properties of soils,** K. Schneeberger, J. Willneff, ETH Zurich (Switzerland) . . . . . [5013-28]

### ✔ Posters–Wednesday

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

✔ **Three-dimensional modeling applications for cultural heritage,** A. Vettore, Univ. degli Studi di Padova (Italy); R. Bologna, Politecnico di Bari (Italy); A. Guarnieri, Univ. degli Studi di Padova (Italy); M. Minchilli, Univ. degli Studi di Sassari (Italy) . . . . . [5013-29]

✔ **Learning a statistical 3D geometric head model,** S. H. Lai, Y. Chen, C. M. Cheng, National Tsing Hua Univ. (Taiwan) . . . . . [5013-30]

✔ **Wearable 3D measurement,** Y. Manabe, M. Imura, Y. Yasumuro, K. Chihara, Nara Institute of Science and Technology (Japan) . . . . . [5013-31]

✔ **Irregular surfaces video digitizing application in compact reverse engineering system,** Y. Polozkov, D. N. Svirsky, Vitebsk State Technological Univ. (Belarus) . . . . . [5013-32]

✔ **Computer simulation of ancient Chinese timber buildings,** Y. Zhu, D. Li, J. Yang, Wuhan Univ. (China) . . . . . [5013-33]

✔ **Conic-based space resection,** G. H. Seedahmed, The Ohio State Univ. and Pacific Northwest National Lab. . . . . [5013-34]

✔ **Retrieval of the interior orientation parameters from the 3D projective camera model: a comparative study and new algorithms,** G. H. Seedahmed, The Ohio State Univ. and Pacific Northwest National Lab. . . . . [5013-35]

✔ **Accurate photorealistic texture mapping for metric 3D models,** V. A. Knyaz, State Research Institute for Aviation Systems (Russia) . . . . . [5013-36]

✔ **Integrated sensors for automatic data acquisition,** B. Li, Q. Li, J. Pan, Wuhan Technical Univ. of Surveying and Mapping (China) . . . . . [5013-37]

✔ **Development of effective procedures for automatic stereo matching,** Y. V. Visilter, S. Y. Zheltov, State Research Institute of Aviation Systems (Russia) . . . . [5013-38]

✔ **Flexible simulation strategy for modeling 3D cultural objects using multisource remotely-sensed imagery,** G. Guienko, Siberian State Geodetic Academy (Russia); E. Levin, Physical Optics Corp. . . . . [5013-39]

**Register by 20 December 2002 and save US $100!**

**Register online!**

Order Proceedings now and take advantage of the special prepublication price: $60

*Proceedings V*olume 5013 will be available onsite.

*See p. 71 to order.*

# Conference 5014

Tuesday–Thursday 21–23 January 2003 • *Proceedings* Vol. 5014

# Image Processing: Algorithms and Systems II

*Conference Chairs:* **Edward R. Dougherty,** Texas A&M Univ.; **Jaakko T. Astola, Karen O. Egiazarian,** Tampere Univ. of Technology (Finland)

*Program Committee:* **Sergey V. Ablameyko,** Institute of Engineering Cybernetics (Belarus); **Sos S. Agaian,** CUNY/College of Staten Island and Univ. of Texas/San Antonio; **Junior Barrera,** Univ. de São Paulo (Brazil); **Reiner Creutzburg,** Fachhochschule Brandenburg (Germany); **Paul D. Gader,** Univ. of Florida; **John C. Handley,** Xerox Corp.; **Vladimir V. Lukin,** National Aerospace Univ. (Ukraine); **Stephen Marshall,** Univ. of Strathclyde (UK); **Françoise J. Prêteux,** Institut National des Télécommunications (France); **Giovanni Ramponi,** Univ. degli Studi di Trieste (Italy); **Akira Taguchi,** Musashi Institute of Technology (Japan)

## Tuesday 21 January

### SESSION 1 . . . . . Tues. 8:50 to 10:10 am

**Image encoding using chaotic maps and strange attractors,** F. Belkhouche, U. Qidwai, Tulane Univ. . . . . [5014-01]

**Image coding using multiple scale leader lattice vector quantization,** A. Vasilache, I. Tabus, Tampere Univ. of Technology (Finland) . . . . . [5014-02]

**Context-based lossless image compression with optimal codes for discretized Laplacian distributions,** C. Doru Giurcaneanu, I. Tabus, C. Stanciu, Tampere Univ. of Technology (Finland) . . . . . [5014-03]

**New horizons in compression,** G. Demos, DemoGraFX, Inc. . . . . [5014-04]

### SESSION 2 . . . . . Tues.10:40 am to Noon

**Enlargement method for JPEG-coded images with the prediction of high-frequency components,** Y. Takahashi, A. Taguchi, Musashi Institute of Technology (Japan) . . . . . [5014-05]

**Interpolation of images containing text for digital displays,** R. Di Federico, M. Raffin, P. Carrai, Philips Research Labs. (Italy); G. Ramponi, Univ. degli Studi di Trieste (Italy) . . . . . [5014-06]

**Snake-growing for contour detection in JPEG compressed domain,** G. Feng, J. Jiang, Univ. of Bradford (UK) . . . . . [5014-07]

**Adaptive window size gradient estimation for image edge detection,** E. Alban, V. Katkovnik, K. O. Egiazarian, Tampere Univ. of Technology (Finland) . . . . . [5014-08]

Lunch Break

### SESSION 3 . . . . . Tues. 1:30 to 3:10 pm

**Statistical characterization of detail preservation,** H. Huttunen, P. T. Koivisto, A. Niemistö, O. P. Yli-Harja, Tampere Univ. of Technology (Finland) . . . . . [5014-09]

**Eigenspace tuning for human standing pose detection,** M. M. Rahman, S. Ishikawa, Kyushu Institute of Technology (Japan) . . . . . [5014-10]

**Adaptive shape transform for color image querying,** M. Celenk, R. K. Godavari, V. Vetnes, Ohio Univ. . . . . [5014-11]

**General approach for multifeature multisensor classification and localization of 3D objects in 2D image sequences,** T. Koelzow, M. M. Ellenrieder, DaimlerChrysler AG (Germany) . . . . . [5014-12]

**Binary matrices, decomposition and multiply-add architectures,** S. S. Agaian, CUNY/College of Staten Island and Univ. of Texas/San Antonio; H. Sarukhanian, Institute of Informatics and Automation Problems (Armenia); J. T. Astola, K. O. Egiazarian, Tampere Univ. of Technology (Finland) . . . . . [5014-13]

Order Proceedings now and take advantage of the special prepublication price: $80

*Proceedings V*olume 5014.

*See p. 71 to order.*

### SESSION 4 . . . . . Tues. 3:40 to 5:00 pm

**Multilevel thresholding by fast PNN-based algorithm,** O. Virmajoki, P. Fränti, Univ. of Joensuu (Finland) . . . . . [5014-14]

**Two-step algorithm for fitting circles, ellipses, spheres, and ellipsoids,** P. O'Leary, Montanuniv. Leoben (Austria) . . . . . [5014-15]

**Esimation of the distribution type and parameters based on multimodal histograms,** K. Marjanen, J. Niemi, H. Ihalainen, O. P. Yli-Harja, Tampere Univ. of Technology (Finland) . . . . . [5014-16]

**New instantaneous frequency estimation method based on the use of image processing techniques,** M. Borda, I. Nafornita, A. Isar, Technical Univ. Timisoara (Romania) . . . . . [5014-17]

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

### SESSION 5 . . . . . Wed. 9:30 to 10:30 am

**Nontraditional cross sections and morphological operations,** A. M. Grigoryan, Univ. of Texas/San Antonio; E. Regentova, Univ. of Nevada/Las Vegas . . . . . [5014-18]

**Nonlinear contrast enhancement based on the Retinex approach,** G. Ramponi, L. Tenze, S. Carrato, S. Marsi, Univ. degli Studi di Trieste (Italy) . . . . . [5014-19]

**Blind evaluation of additive noise variance in textured images by nonlinear processing of block DCT coefficients,** N. N. Ponomarenko, V. V. Lukin, S. Abramov, National Aerospace Univ. (Ukraine); K. O. Egiazarian, J. T. Astola, Tampere Univ. of Technology (Finland) . . . . . [5014-20]

### SESSION 6 . . . . . Wed.11:00 am to Noon

**Order filters in superresolution reconstruction,** M. Trimeche, J. Yrjanainen, Nokia Research Ctr. (Finland) . . . . . [5014-21]

**Rank and morphological filtering based on recurrent Hough transform in a sliding window,** Y. V. Vizilter, State Research Institute of Aviation Systems (Russia) [5014-22]

**Applications of aperture filters,** E. R. Dougherty, Texas A&M Univ.; R. Hirata, Jr., Univ. de São Paulo (Brazil) . . . . . [5014-23]

Lunch/Exhibition Break

### SESSION 7 . . . . . Wed. 1:40 to 3:00 pm

**Comparison of PDE-based nonlinear anistropic diffusion techniques for image denoising,** C. Kamath, S. K. Weeratunga, Lawrence Livermore National Lab. [5014-24]

**Acceleration in iterative image restoration by manipulation of gain parameter,** E. Salari, P. V. Athavale, Univ. of Toledo . . . . . [5014-25]

**Tensor form of image representation: enhancement by image-signals,** A. M. Grigoryan, S. S. Agaian, Univ. of Texas/San Antonio . . . . . [5014-26]

**MFA-SPINE noise reduction for text images,** J. H. Uchill, A. H. Assadi, Univ. of Wisconsin/Madison . . . . . [5014-27]

## SESSION 8 . . . . . Wed. 3:30 to 5:10 pm

**Flexible framework for developing cooperative intelligent image analysis systems,** K. Ranaweera, J. K. Samarabandu, Univ. of Western Ontario (Canada) . . . . . [5014-28]

**Video abstraction generation supervised by user preference,** Y. M. Ro, B. Bae, Information and Communication Univ. (Korea) . . . . . [5014-29]

**Generalized optimum approximation of filter banks in t/f domains and its application to the design of wireless transmultiplexer,** T. Kida, Nihon Univ. (Japan); Y. Kida, Hitachi Ltd. (Japan) . . . . . [5014-30]

**Use of machine vision techniques to detect human settlements in satellite images,** C. Kamath, S. K. Sengupta, D. N. Poland, J. A. Futterman, Lawrence Livermore National Lab. . . . . [5014-31]

**Pose estimation using linear or nonlinear composite correlation filters and a neural network,** M. Castro, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Y. Frauel, Univ. Nacional Autónoma de México; E. Tepichín-Rodriguez, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); B. Javidi, Univ. of Connecticut [5014-32]

### ✔ Posters–Wednesday

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

✔ **Lossless compression for x-ray mammogram images,** A. F. Abu-Hajar, R. T. Sankar, Univ. of South Florida . . . . . [5014-38]

✔ **Wavelet image coding with parametric thresholding: application to JPEG2000,** A. Ouled Zaid, C. Olivier, F. Marmoiton, Univ. de Poitiers (France) . . . . . [5014-39]

✔ **Fractal image compression based on Fuzzy theory,** K. B. Abraham, Y. Yang, Univ. of Science and Technology of China . . . . . [5014-40]

✔ **Physics-based shape deformations for medical image analysis,** G. Hamarneh, Univ. of Toronto (Canada) . . . . . [5014-41]

✔ **Method for repair of defects in range data observed with a laser range scanner,** T. Saito, T. Komatsu, S. Sunaga, Kanagawa Univ. (Japan) . . . . . [5014-42]

✔ **Remote sensing image fustion based on PCA and WT,** B. Li, J. Wei, Information Engineering Univ. (China) . . . . . [5014-43]

✔ **Multivalued images curvatures: application to features detection and mean curvature flow restoration,** B. Tremblais, B. Augereau, M. Leard, Univ. de Poitiers (France) . . . . . [5014-44]

✔ **New design method of general weighted median filters admitting negative weights for enhancement of images degraded by additive noise,** M. Meguro, M. Kaneko, A. Kurematsu, Univ. of Electro-Communications (Japan) . . . . . [5014-45]

✔ **Processing with nonlinear filters satellite imagery,** K. Karantzalos, A. Georgopoulos, National Technical Univ. of Athens (Greece) . . . . . [5014-46]

✔ **Multiresolution analysis and nested sets of segmentations application to to microscopic analysis of glass soiled via atmospheric pollution,** J. P. Jacob, Univ. Paris XII Val de Marne (France); C. Vachier, Ecole Normale Supériure de Cachan (France) . . . . . [5014-47]

✔ **Improved filterbank approach to fingerprint recognition,** E. Bezhani, Univ. degli Studi di Trieste (Italy); D. Sun, Dspfactory (Switzerland); J. L. Nagel, Univ. de Neuchâtel (Switzerland); S. Carrato, Univ. degli Studi di Trieste (Italy) . . [5014-48]

✔ **Algorithm of extracting straight line using randomized Hough transform based on Zernike orthogonal moment,** J. Li, Harbin Institute of Technology (China); S. Chen, Shanghai Jiao Tong Univ. (China); L. Wu, Harbin Institute of Technology (China) . . . . . [5014-49]

✔ **Parametric slant Hadamard transforms,** S. S. Agaian, City Univ. of New York; K. Tourshan, Lockheed Martin NE&SS Surface Systems; J. P. Noonan, Tufts Univ. . . . . [5014-50]

✔ **Detectors of the impulsive noise and new effective filters for impulsive noise reduction,** D. Paliy, Tampere Univ. of Technology (Finland); I. N. Aizenberg, C. Butakoff, T. Bregin, Neural Networks Technologies Ltd. (Israel); J. T. Astola, K. O. Egiazarian, Tampere Univ. of Technology (Finland) . . . . . [5014-51]

✔ **Research on the center location of non-eye typhoon in satellite cloud image,** Z. Liu, H. Qiu, B. Wu, Tianjin Univ. (China) . . . . . [5014-52]

✔ **Novel algorithm for the handling of occlusion for visual traffic surveillance,** C. C. Pang, W. L. Lam, N. H. Yung, Univ. of Hong Kong . . . . . [5014-53]

✔ **Functional image processing using Kalman filter,** Z. Guo, Univ. of Sydney (Australia); D. D. Feng, Hong Kong Polytechnic Univ. (Hong Kong) . . . . . [5014-54]

✔ **Estimation of population effects in synchronized budding yeast experiments,** A. Niemistö, K. Marjanen, Tampere Univ. of Technology (Finland); M. Tiainen, Medicel Oy (Finland); O. P. Yli-Harja, Tampere Univ. of Technology (Finland) . . . . [5014-55]

✔ **Single pixel information content,** E. Diamant, Tel Aviv Univ. (Israel) . . . . [5014-56]

✔ **PLD-based algorithm for founding the centroids of multiple objects in video images,** F. Nicolato, M. K. Madrid, Univ. Estadual de Campinas (Brazil) . [5014-57]

## Thursday 23 January

**Plenary Speaker . . . . . Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

## SESSION 9 . . . . . Thurs. 9:30 to 11:40 am

**Automatic prostate boundary detection in ultrasound images using multiresolution deformable models and fuzzy logic,** N. Nanayakkara, J. K. Samarabandu, Univ. of Western Ontario (Canada) . . . . . [5014-33]

**Trajectory recognition using state transition learning,** T. Ae, K. Sakai, K. Otaka, N. D. Chuong, Hiroshima Univ. (Japan) . . . . . [5014-34]

**Evaluating performance of automatic techniques for sub-pixel registration of remotely sensed imagery,** I. Zavorin, J. Le Moigne, NASA Goddard Space Flight Ctr. . . . . [5014-35]

**Imaging techniques applied to quality control of civil manufactured goods obtained starting from ready to use mixtures,** G. Bonifazi, Univ. degli Studi di Roma La Sapienza (Italy) . . . . . [5014-36]

**Wavelet-based image analysis system for soil texture analysis,** Y. Sun, Z. Long, P. R. Jang, M. J. Plodinec, Mississippi State Univ. . . . . [5014-37]

Order Proceedings now and take advantage of the special prepublication price: $80

*Proceedings V*olume 5014.

*See p. 71 to order.*

# Conference 5015

Thursday–Friday 23–24 January 2003 • *Proceedings* Vol. 5015

# Applications of Artificial Neural Networks in Image Processing VIII

*Conference Chairs:* **Nasser M. Nasrabadi,** Army Research Lab.; **Aggelos K. Katsaggelos,** Northwestern Univ.

*Program Committee:* **Pierre Baldi,** California Institute of Technology; **Yoshua Bengio,** Univ. de Montréal (Canada); **Bir Bhanu,** Univ. of California/Riverside; **Terry M. Caelli,** Curtin Univ. of Technology (Australia); **Rama Chellappa,** Univ. of Maryland/College Park; **Chang Y. Choo,** San Jose State Univ.; **John Daugman,** Univ. of Cambridge (UK); **Sandor Z. Der,** Army Research Lab.; **Edward R. Dougherty,** Texas A&M Univ.; **Kunihiko Fukushima,** Tokyo Univ. of Technology (Japan); **Erol Gelenbe,** Univ. of Central Florida; **David H. Haussler,** Univ. of California/Santa Cruz; **Nicolaos B. Karayiannis,** Univ. of Houston; **Christof Koch,** California Institute of Technology; **Bart Kosko,** Univ. of Southern California; **Sun-Yuan Kung,** Princeton Univ.; **Yann Le Cun,** AT&T Labs.; **Richard P. Lippmann,** MIT Lincoln Lab.; **Vincent Mirelli,** Army Research Lab.; **Erkki Oja,** Helsinki Univ. of Technology (Finland); **Sankar K. Pal,** Indian Statistical Institute (India); **Tomaso A. Poggio,** MIT AI Lab.; **Syed A. Rizvi,** CUNY/College of Staten Island; **David E. Rumelhart,** Stanford Univ.; **Michael Seibert,** MIT Lincoln Lab.; **Christoph von der Malsburg,** Univ. of Southern California; **Jacek M. Zurada,** Univ. of Louisville

## Thursday 23 January

**Plenary Speaker** . . . . . **Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

**SESSION 1** . . . . . **Thurs. 1:30 to 3:10 pm**

**Shape and Character Recognition Using Neural Networks**

*Chair:* **Nasser M. Nasrabadi,** Army Research Lab.

**Automatic target recognition of cluttered FLIR imagery using multistage feature extraction and feature repair,** S. A. Rizvi, CUNY/College of Staten Island; N. M. Nasrabadi, Army Research Lab. . . . . [5015-01]

**Selective visual attention in object detection processes,** L. Paletta, Joanneum Research (Austria); A. Goyal, Indian Institute of Technology (India); C. Greindl, Joanneum Research (Austria) . . . . . [5015-02]

**Logo detection with geostatistics and neural networks,** T. Pham, Defence Science and Technology Organisation (Australia) . . . . . [5015-03]

**Character recognition by synergetic neural network based on selective attention parameters,** M. Wang, Y. Mo, J. Ma, Shanghai Univ. (China) . . . . . [5015-04]

**Methods of recognizing chips' shape based on neural net,** X. Liu, L. Zhang, Q. Yuan, F. Yan, Harbin Univ. of Science and Technology (China) . . . . . [5015-05]

**SESSION 2** . . . . . **Thurs. 3:30 to 5:10 pm**

**Neural Networks and Genetic Algorithms**

*Chair:* **Sandor Z. Der,** Army Research Lab.

**Real-time camera-based face detection using a modified LAMSTAR neural network system,** J. I. Girado, L. K. Wolf, D. J. Sandin, T. A. DeFanti, Univ. of Illinois/Chicago . . . . . [5015-06]

**Pose-invariant face-head identification using a bank of neural networks and the 3D neck reference point,** M. Hild, K. Yoshida, M. Hashimoto, Osaka Electro-Communication Univ. (Japan) . . . . . [5015-07]

**Using neural networks to improve the performance of the hybrid evolutionary algorithm in image registration,** I. V. Maslov, CUNY/Graduate Ctr.; I. Gertner, CUNY/City College . . . . . [5015-08]

**Winner take all dynamics in an optoelectronic feedback circuit for image processing,** A. J. Raglin, Army Research Lab. and Howard Univ.; M. F. Chouikha, Howard Univ. . . . . [5015-09]

**Application of neural network and genetic algorithms in the classification of blood cells,** L. Zeng, B. Liu, Wuhan Univ. (China); Z. Zhang, Hermes-Microvision Co. . . . . [5015-10]

## Friday 24 January

**SESSION 3** . . . . . **Fri. 8:30 to 10:10 am**

**Neural Network Techniques for Image Reconstruction and Restoration**

*Chair:* **Syed A. Rizvi,** CUNY/College of Staten Island

**Image restoration using mapping neural networks: theory and practice,** D. Wang, T. S. Dillon, La Trobe Univ. (Australia) . . . . . [5015-11]

**Stereo matching approach based on wavelet analysis for 3D reconstruction in neurovision system,** Y. Xiong, F. K. H. Quek, Wright State Univ. . . . . [5015-12]

**Three-dimensional reconstruction using the line segment,** S. D. Cho, K. H. Yoon, Chung-Ang Univ. (Korea) . . . . . [5015-13]

**Dynamic electrical impedance tomography method based on multilevel BP neural network,** Y. Peng, Y. Mo, Shanghai Univ. (China) . . . . . [5015-14]

**Image reconstruction in dynamic electrical impedance tomography based on neural network,** W. Hou, Shanghai Univ. (China) . . . . . [5015-15]

**SESSION 4** . . . . . **Fri.10:30 am to 12:30 pm**

**Neural Network Techniques for Associative Memory, Enhancement, Fusion, and Segmentation**

*Chair:* **Syed A. Rizvi,** CUNY/College of Staten Island

**Associative storage of multiple image patterns in a feedback neural network,** C. J. Hu, Southern Illinois Univ./Carbondale . . . . . [5015-16]

**Neural network-based image resolution enhancement from a multiple of low-resolution images,** E. Salari, S. Zhang, Univ. of Toledo . . . . . [5015-17]

**Multiresolution-based committees of networks: a Bayesian point of view,** W. Asdornwised, S. Jitapunkul, Chulalongkorn Univ. (Thailand) . . . . . [5015-18]

**Hybrid phase couple neuron networks Gabor filter for image analysis and segmentation,** K. B. Abraham, Y. Yang, Univ. of Science and Technology of China . . . . . [5015-19]

**Identifying the scene illumination using genetic algorithms and neural networks,** S. Karungaru, M. Fukumi, N. Akamatsu, Univ. of Tokushima (Japan) . . . . . [5015-20]

**Applying cellular neural network to combining multiple segmentation results in texture image segmentation,** K. Ge, S. Oe, Univ. of Tokushima (Japan) . . . . [5015-21]

Order Proceedings now and take advantage of the special prepublication price: $53

*Proceedings V*olume 5015.

*See p. 71 to order.*

# Conference 5016

Wednesday–Friday 22–24 January 2003 • *Proceedings* Vol. 5016

# Computational Imaging

*Conference Chairs:* **Charles A. Bouman,** Purdue Univ.; **Robert L. Stevenson,** Univ. of Notre Dame

*For a full list of sessions and paper order, please check the meeting website at www.electronicimaging.org*


**Surface modeling using intelligent database techniques,** S. M. El-Hefnawy, Mansoura Univ. (Egypt) . . . . . [5016-601]

**Two-dimensional perfect reconstruction structures for computational image processing,** M. das Graças de Almeida, Ctr. Federal de Educacao Tecnologica de Minas Gerais (Brazil) . . . . . [5016-603]

**Boundary extraction and polarimetry in translucent specimens for photoelastic stress analysis,** A. Ghali, T. Pridmore, A. Jones, P. Wang, A. Becker, Univ. of Nottingham (UK) . . . . . [5016-607]

**Statistically based reflection model for rough surfaces,** Y. Sun, Purdue Univ. . . . . [5016-608]

**Contour-based image mosaicking in the presence of moving objects,** S. Y. Jung, Y. H. Choi, T. S. Choi, Kwangju Institute of Science and Technology (Korea) . . . [5016-609]

**Three-dimensional estimation using genetic algorithms from image sequence in an active stereo vision system,** A. Dipanda, J. Ajot, S. Woo, Univ. de Bourgogne (France) . . . . . [5016-611]

**MR spectroscopic image reconstruction using structural information from anatomical MR images,** T. S. Denney, Jr., S. J. Reeves, Auburn Univ. . . . . [5016-612]

**Content-adaptive mesh modeling for image inverse problems,** Y. Yang, J. Brankov, N. P. Galatsanos, Illinois Institute of Technology . . . . . [5016-613]

**Bayesian estimation for rheological MRI,** K. D. Sauer, F. Feron, Univ. of Notre Dame . . . . . [5016-614]

**Pyramid algorithms as models of human cognition,** Z. Pizlo, Z. Li, Purdue Univ. . . . . [5016-615]

**Computational 3D reconstructions by optimization for cryo-electron microscopy,** P. C. Doerschuk, Z. Yin, Y. Zheng, Purdue Univ. . . . . [5016-616]

**Mosaics from MPEG-2 video,** M. A. Robertson, Air Force Research Lab.; T. S. Heath, Northrop Grumman Corp. . . . . [5016-617]

**Nonlinear multigrid for imaging electrical conductivity and permittivity at low frequency,** L. Borcea, Rice Univ. . . . . [5016-618]

**Optimization of Bayesian tomographic reconstruction for region of interest quantitation,** J. Qi, Lawrence Berkeley National Lab. . . . . [5016-619]

**New approaches in 3D ultrasound image segmentation,** E. J. Delp III, Purdue Univ. . . . . [5016-620]

**Tomographic reconstruction of dynamic objects,** Y. Shi, W. C. Karl, Boston Univ. . . . . [5016-621]

**GPS-based spatial and spectral registration of delta-multipass SAR imagery for coherent change detection,** M. Soumekh, Univ. at Buffalo . . . . . [5016-622]

**Computational synthetic aperture radar imaging: methods and applications,** V. C. Chen, Naval Research Lab. . . . . [5016-623]

**Diversity waveform techniques in delay-Doppler imaging,** M. R. Bell, Purdue Univ. . . . . [5016-624]

**Image resampling and constraint formulation for multiframe superresolution restoration,** S. Borman, R. L. Stevenson, Univ. of Notre Dame . . . . . [5016-625]

**Tutorial on nonlinear multiscale filtering of images,** I. Pollak, Purdue Univ.[5016-626]

**Multigrid algorithms for optimization and inverse problems,** S. Oh, A. B. Milstein, C. A. Bouman, K. J. Webb, Purdue Univ. . . . . [5016-627]

**Quasi-monte carlo point sets: halftoning in N dimensions?,** K. M. Hanson, Los Alamos National Lab. . . . . [5016-628]

**Transport theory inverse problem in optical tomographic imaging: from theory to clinical applications,** A. Hielscher, Columbia Univ. . . . . [5016-629]

**Wavelet methods for medical tomography,** B. J. Lucier, Purdue Univ. . . . . [5016-630]

**Bayesian data fusion and credit assignment in vision and fMRI data analysis,** P. Schrater, Univ. of Minnesota . . . . . [5016-63]

**4D Structure from Motion,** M. Ge, M. D'Zmura, Univ. of California/Irvine . [5016-632]



Order Proceedings now and take advantage of the special prepublication price: $60

*Proceedings V*olume 5016.



*See p. 71 to order.*

# Conference 5017A

Wednesday–Thursday 22–23 January 2003 • Part of *Proceedings of SPIE* Vol. 5017
Sensors and Cameras Systems for Scientific, Industrial, and Digital Photography Applications IV

# Sensors, Cameras, and Systems for Scientific/Industrial Applications V

*Conference Chair:* **Morley M. Blouke,** Scientific Imaging Technologies, Inc.

*Program Committee:* **Joseph Carbone,** Thermo CIDTEC; **Taner Dosluoglu,** Sarnoff Corp.; **Sayed I. Eid,** Gentex Corp.; **Terrence S. Lomheim,** The Aerospace Corp.; **Gloria G. Putnam,** Eastman Kodak Co.; **Nobukazu Teranishi,** Matsushita Electronics Co. (Japan); **Orly Yadid-Pecht,** Ben-Gurion Univ. of the Negev (Israel)

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

### SESSION 1 . . . . . Wed. 9:30 am to Noon

**Broadcast quality 3840 x 2160 color imager operating at 30 frames/s,** R. M. Iodice, M. Joyner, C. S. Hong, D. Parker, Photon Vision Systems, Inc. . . . . [5017-01]

**Image sensor for the detection of fast moving luminous objects,** B. Bellach, B. Lamalle, L. F. C. Lew Yan Voon, Univ. de Bourgogne (France); G. Cathebras, Univ. Montpellier II (France) . . . . . [5017-02]

**1024 x 1280 pixel synchronous shutter APS for industrial vision,** H. Witters, T. Walschap, G. Vanstraelen, G. Meynants, G. Chapinal, B. Dierickx, FillFactory (Belgium) . . . . . [5017-03]

**Demonstration of a frequency-demodulation image sensor,** K. Yamamoto, K. Kagawa, J. Ohta, M. Nunoshita, Nara Institute of Science and Technology (Japan); Y. Yamasaki, K. Watanabe, Microsignal Co., Ltd. (Japan) . . . . . [5017-04]

**System implementation of a CMOS vision chip for visual recovery,** A. Uehara, T. Furumiya, K. Isakari, D. C. Ng, K. Kagawa, T. Tokuda, J. Ohta, M. Nunoshita, Nara Institute of Science and Technology (Japan) . . . . . [5017-05]

**Versatile sensor surface interface for programmable vision systems-on-chip,** S. Espejo, E. Roca, G. Linan, R. Dominguez-Castro, A. Rodriguez-Vazquez, Instituto de Microelectronica de Sevilla (Spain) . . . . . [5017-06]

Lunch/Exhibition Break

### SESSION 2 . . . . . Wed. 1:30 to 5:30 pm

**Noise calculation model for high-gain column amplifiers of CMOS image sensors,** S. Kawahito, N. Kawahi, Shizuoka Univ. (Japan) . . . . . [5017-07]

**Hot carriers effects and electroluminescence in the CMOS photodiode active pixel sensors,** S. Maestre, F. Lavernhe, P. Magnan, F. Corbiere, SUPAERO (France) [5017-08]

**Photon count imaging using an extremely small capacitor and a high-precision low-noise quantizer,** S. Kawahito, S. Itoh, Shizuoka Univ. (Japan) . . . . . [5017-09]

**Method to extend dynamic range of CMOS image sensor using different frame-rate read out,** M. Sasaki, Toyohashi Univ. of Technology (Japan); S. Kawahito, Shizuoka Univ. (Japan) . . . . . [5017-10]

**CMOS image sensor working as high-speed photo receivers as well as a position sensor for indoor optical wireless LAN systems,** K. Kagawa, T. Nishimura, J. Ohta, M. Nunoshita, Nara Institute of Science and Technology (Japan); Y. Yamasaki, K. Watanabe, Microsignal Co., Ltd. (Japan) . . . . . [5017-11]

**Accurate measurement of conversion gain and quantum efficiency in CMOS imagers,** B. Pain, B. Hancock, Jet Propulsion Lab. . . . . [5017-28]

**Calibration and use of video cameras in the photometric measurement of aerodrome ground lighting,** K. McMenemy, F. Mullin, G. Dodds, Queen's Univ. Belfast (Ireland) . . . . . [5017-12]

**Field observation of surface conditions using LCTF spectropolarimeter,** H. Shingu, K. Homma, National Aerospace Lab. (Japan); H. Kurosaki, Keio Research Institute (Japan); T. Suzuki, Remote Sensing Technology Ctr. (Japan); H. Yamamoto, National Aerospace Lab. (Japan) . . . . . [5017-13]

**Spectral matching imager using correlation image sensor and AM-coded multispectral illumination,** A. Kimachi, Y. Ishikawa, K. Umehara, Y. Kitajima, N. Sugita, A. Fukui, Osaka Electro-Communication Univ. (Japan) . . . . . [5017-14]

**Simulating broadband illuminants for sensor and camera performance testing,** R. Gazerro, Gamma Scientic Co. . . . . [5017-42]

**Research on stare infrared zoom optics with diffractive elements of digital image sensor,** H. Liu, The 613th Resarch Institute of AVIC (China) . . . . . [5017-15]

**Pattern recognition of top-side pool image in aluminum aloy TIG welding,** J. J. Wang, T. Lin, S. B. Chen, J. C. Hu, Shanghai Jiao Tong Univ. (China) . . . . . [5017-16]

### ✔ Posters–Wednesday

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

✔ **Image data capture system for electrical capacitance tomography,** X. Yu, G. Zhang, D. Chen, Q. Xu, Harbin Univ. of Science and Technology (China) [5017-23]

✔ **Analysis of system noise in thermal imagers,** K. Marjanen, O. P. Yli-Harja, Tampere Univ. of Technology (Finland) . . . . . [5017-24]

✔ **Performance of an extended dynamic range time delay integration charge coupled device (XDR TDI CCD) for high intrascene dynamic range scanning,** R. M. Dawson, P. A. Levine, J. T. Andrews, M. Bhaskaran, D. Furst, F. Hsueh, G. M. Meray, T. M. Sudol, P. K. Swain, J. R. Tower, Sarnoff Corp. . . . . [5017-25]

✔ **Measurements of charge spreading in Marconi CCDs,** C. McFee, L. Bradley, Univ. College London (UK) . . . . . [5017-26]

✔ **Open source array control hardware and software,** A. Moore, Z. Ninkov, Rochester Institute of Technology . . . . . [5017-27]

## Thursday 23 January

**Plenary Speaker . . . . . Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

### SESSION 3 . . . . . Thurs. 9:30 am to Noon

**Optimization of CCD performances at high frequencies,** D. Dantes, Alcatel Space (France) . . . . . [5017-17]

**Ultrahigh-definition color camera system with 4K-scanning lines,** K. Mitani, M. Sugawara, H. Shimamoto, T. Yamashita, F. Okano, NHK Science and Technical Research Labs. (Japan) . . . . . [5017-18]

**Large area interline CCD with low dark current,** C. Parks, D. L. Losee, Eastman Kodak Co. . . . . [5017-19]

**PSF measurements on back-illuminated CCDs,** R. Widenhorn, Portland State Univ. . . . . [5017-20]

**Simulation-based development and characterization of a CCD architecture for 1 million frames per second,** D. Poggemann, Fachhochschule Osnabrueck (Germany); T. G. Etoh, Kinki Univ. (Japan); A. Ruckelshausen, Fachhochschule Osnabrueck (Germany); A. J. Theuwissen, DALSA BV and Technische Univ. Delft (Netherlands); J. T. Bosiers, DALSA BV (Netherlands); H. Mutoh, Link Research Corp. (Japan); Y. Kondo, Shimadzu Corp. (Japan) . . . . . [5017-21]

**4-micron pixel CMOS image sensor with low image lag and high-temperature operability,** Y. Endo, Y. Nitta, H. Kubo, T. Murao, K. Shimomura, M. Kimura, K. Watanabe, S. Yamamoto, S. Komori, Mitsubishi Electric Corp. (Japan) . . . . [5017-22]

# Conference 5017B

Tuesday 21 January 2003 • Part of *Proceedings of SPIE* Vol. 5017
Sensors and Cameras Systems for Scientific, Industrial, and Digital Photography Applications IV

# Sensors, Cameras, and Applications for Digital Photography Applications V

*Conference Chairs:* **Nitin Sampat,** Rochester Institute of Technology; **Ricardo J. Motta,** PIXIM, Inc.

## Tuesday 21 January

**SESSION 4 . . . . . Tues. 9:00 am to 12:10 pm**


**Digital camera system built on JPEG2000 compression and decompression,** E. Atsumi, Nokia Japan Co., Ltd. (Japan) . . . . . [5017-29]

**Color filter selection for digital cameras,** U. Barnhoefer, J. M. DiCarlo, Stanford Univ.; B. P. Olding, Pixim, Inc.; B. A. Wandell, Stanford Univ. . . . . [5017-30]

**Color image acquisition method using color filter arrays occupying overlapped color spaces,** T. Saito, T. Komatsu, Kanagawa Univ. (Japan) . . . . . [5017-31]

**Sharpening methods for images captured through Bayer matrix,** H. Rantanen, O. Kalevo, Nokia Research Ctr. (Finland) . . . . . [5017-32]

**Dyed red, green, and blue photoresists for the manufacture of high-resolution color filter arrays for image sensors,** D. J. Guerrero, T. D. Flaim, C. Schott, R. Mercado, W. DiMenna, J. Storie, M. Spencer, Brewer Science, Inc. . . . . [5017-33]

**Joint temporal and spatial color demosaic,** X. Wu, N. Zhang, McMaster Univ. (Canada) . . . . . [5017-34]

**New concept high-speed and high-resolution color scanner,** K. Nakashima, S. Shinoda, Y. Konishi, K. Sugiyama, T. Hori, Hitachi, Ltd. (Japan) . . . . . [5017-35]

**Make wide-angled digital camera by combining small-sized areal array CCD sensors,** W. Xuan, X. Liu, Z. Lin, Chinese Academy of Surveying and Mapping (China) [5017-36]


Lunch Break

**SESSION 5 . . . . . Tues. 1:30 to 3:10 pm**


**Analysis and characterization of superresolution reconstruction methods,** G. Messina, S. Battiato, M. Mancuso, STMicroelectronics (Italy); G. Gallo, F. Stanco, Univ. di Catania (Italy) . . . . . [5017-37]

**Compuatationally efficient algorithm for multifocus image reconstruction,** H. Eltoukhy, S. Kavusi, Stanford Univ. . . . . [5017-38]

**Theoretical and experimental analyses of white balancing,** F. Xiao, Stanford Univ.; J. E. Farrell, Shutterfly; J. M. DiCarlo, B. A. Wandell, Stanford Univ. . . . . [5017-39]

**Automatic discrimination of text images,** S. Battiato, STMicroelectronics (Italy); N. Alessi, G. Gallo, F. Stanco, Univ. di Catania (Italy); M. Mancuso, STMicroelectronics (Italy) . . . . . [5017-40]

**Adaptive pixel defect correction,** A. A. Tanbakuchi, Dalsa Eindhoven B.V. . . [5017-41]



Order Proceedings now and take advantage of the special prepublication price: $70

*Proceedings V*olume 5017.



*See p. 71 to order.*

# Conference 5018

Tuesday–Wednesday 21–22 January 2003 • *Proceedings* Vol. 5018

# Internet Imaging IV

*Conference Chairs:* **Simone Santini,** Univ. of California/San Diego; **Raimondo Schettini,** DISCO, Univ. of Milano Bicocca (Italy)

*Program Committee:* **Jeffrey Boyd,** Univ. of Calgary (Canada); **Alberto Del Bimbo,** Univ. degli Studi di Firenze (Italy); **Theo Gevers,** Univ. of Amsterdam (Netherlands); **Jennifer Gille,** Raytheon ITSS; **Neil J. Gunther,** Performance Dynamics Consulting; **Amarnath Gupta,** Univ. of California/San Diego; **Roger D. Hersch,** Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Yasuyo G. Ichihara,** Hosen-Gakuen College (Japan); **Corinne Jörgensen,** Univ. at Buffalo; **Clement H. Leung,** Victoria Univ. of Technology (Australia); **Stéphane Marchand-Maillet,** Univ. de Genève (Switzerland); **Lloyd McIntyre,** Xerox Corp.; **Simon Shim,** San Jose State Univ.; **Sabine E. Süsstrunk,** Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Alain Tremeau,** Univ. Jean Monnet (France); **Yujin Zhang,** Tsinghua Univ. (China)

## Tuesday 21 January

**SESSION 1 . . . . . Tues. 8:30 to 9:15 am**

**Invited Paper I**

*Chair:* **Stéphane Marchand-Maillet,** Univ. de Genève (Switzerland)

**Experiential environments** *(Invited Paper, Presentation Only),* R. C. Jain, Univ. of California/San Diego . . . . . [5018-01]

**SESSION 2 . . . . . Tues. 9:15 to 9:55 am**

**Visual Indexing and Retrieval I**

*Chair:* **Stéphane Marchand-Maillet,** Univ. de Genève (Switzerland)

**Method for comparing content-based image retrieval methods,** K. Barnard, Univ. of Arizona; P. Duygulu, Middle East Technical Univ. (Turkey); D. A. Forsyth, Univ. of California/Berkeley . . . . . [5018-02]

**Comparing the performance of two CBIRS indexing schemes,** W. Müller, G. Robbert, A. Henrich, Univ. Bayreuth (Germany) . . . . . [5018-03]

**SESSION 3 . . . . . Tues.10:30 to 11:50 am**

**Imaging and Video Technologies**

*Chair:* **Simon Shim,** San Jose State Univ.

**PanoramaSeek: intelligent streaming for Internet video retrieval,** K. Wakimoto, J. Kanda, S. Tanaka, S. Usui, Mitsubishi Electric Corp. (Japan) . . . . . [5018-04]

**Host-interference rejecting watermarking for robust image authentication,** F. Guerrini, M. G. Albanesi, M. Ferretti, Univ. degli Studi di Pavia (Italy) . . . . . [5018-05]

**Autosophy still image compression,** K. E. Holtz, Autosophy and Squish, Inc.; E. S. Holtz, Autosophy . . . . . [5018-06]

**Comparative study of DCT- and wavelet ®C-based image compression,** L. Gao, Tsinghua Univ. and PTIC Capitel Co. (China); Y. Zhang, Tsinghua Univ. (China) . . . . . [5018-07]

Lunch Break

**SESSION 4 . . . . . Tues. 1:30 to 3:10 pm**

**Telepresence**

*Chair:* **Yasuyo G. Ichihara,** Hosen-Gakuen College (Japan)

**Internet telepresence by real-time view-dependent image generation with omnidirectional video camera,** S. Morita, K. Yamazawa, N. Yokoya, Nara Institute of Science and Technology (Japan) . . . . . [5018-08]

**Multilevel model for motion analysis and description,** T. Foures, P. Joly, Institut de Recherche en Informatique de Toulouse (France) . . . . . [5018-09]

**Preparation and presentation of cultural content in virtual environment,** J. Zara, Czech Technical Univ. (Czech Republic) . . . . . [5018-10]

**Interactive Internet-based pendulum for learning mechatronics,** M. R. Sethson, Linköping Univ. (Sweden) . . . . . [5018-11]

**Facial expression presentation for real-time Internet communication,** A. Dugarry, A. Berrada, S. Fu, Cranfield Univ. (UK) . . . . . [5018-12]

**SESSION 5 . . . . . Tues. 3:30 to 4:30 pm**

**Visual Networked Environments**

*Chair:* **Neil J. Gunther,** Performance Dynamics Consulting

**Role of Internet images in the bioinformatics research network,** S. Santini, A. Gupta, Univ. of California/San Diego . . . . . [5018-13]

**Web-based distributed iamge processing system,** C. Y. Han, H. Chen, L. He, W. G. Wee, Univ. of Cincinnati . . . . . [5018-14]

**Digital environment for digiTV: designing an automatized feedback and broadcast architecture for digital interactive TV,** A. R. Lugmayr, S. Kalli, A. Mailaparampil, Tampere Univ. of Technology (France) . . . . . [5018-15]

**SESSION 6 . . . . . Tues. 4:30 to 5:30 pm**

**Visual Indexing and Retrieval II**

*Chair:* **Clement H. Leung,** Victoria Univ. of Technology (Australia)

**World Wide Web-based image search engine using text and image content features,** B. Luo, X. Wang, X. Tang, Chinese Univ. of Hong Kong . . . . . [5018-16]

**Extensible object-oriented description of visual document content,** S. Marchand-Maillet, C. Jelmini, Univ. de Genève (Switzerland) . . . . . [5018-17]

**Automatic image categorization using MPEG-7 description,** Y. M. Ro, S. J. Yang, J. H. Yoon, Information and Communications Univ. (Korea) . . . . . [5018-18]

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

**SESSION 7 . . . . . Wed. 9:30 to 10:15 am**

**Invited Paper II**

*Chair:* **Stephane Marchand-Maillet,** Univ. de Genève (Switzerland)

**Structured scalable meta-formats for digital item application** *(Invited Paper),* D. Mukherjee, A. Said, Hewlett-Packard Labs. . . . . [5018-19]

**SESSION 8 . . . . . Wed.10:45 to 11:30 am**

**Invited Paper III**

*Chair:* **Amarnath Gupta,** Univ. of California/San Diego

**Recognition as translating images into text** *(Invited Paper),* K. Barnard, Univ. of Arizona . . . . . [5018-20]

Lunch/Exhibition Break

Order Proceedings now and take advantage of the special prepublication price: $60

*Proceedings V*olume 5018 will be available onsite.

*See p. 71 to order.*

## SESSION 9 . . . . . Wed. 1:30 to 3:10 pm

### Visual Indexing and Retrieval III

*Chair:* **Jeffrey Boyd,** Univ. of Calgary (Canada)

**Characterization of color distributions with density estimates and histograms,** L. V. Tran, R. Lenz, Linköping Univ. (Sweden) . . . . . [5018-21]

**XML data model for inverted image indexing,** S. W. So, Hong Kong Institute of Education (Hong Kong); C. H. Leung, Victoria Univ. of Technology (Australia)[5018-22]

**Efficient clustering-based fuzzy matching approach for online image retrieval,** R. Zhang, Z. M. Zhang, Binghamton Univ. . . . . [5018-23]

**Relevance feedback in image retrieval: a new approach using positive and negative examples,** M. L. Kherfi, D. Ziou, Univ. de Sherbrooke (Canada); A. Bernardi, Laboratoires Univ. Bell (Canada) . . . . . [5018-24]

**Image similarity measures for video processing,** L. J. Latecki, Temple Univ. [5018-25]

## SESSION 10 . . . . . Wed. 3:40 to 5:00 pm

### Visual Languages for the Web

*Chair:* **Sabine E. Süsstrunk,** Ecole Polytechnique Fédérale de Lausanne (Switzerland)

**M3D (media 3D): a new programming language for web-based virtual reality in e-learning and edutainment,** S. Chakaveh, D. Skaley, P. Laine, R. Haeger, S. Maad, Fraunhofer-Institut für Medienkommunikation (Germany) . . . . . [5018-26]

**SVG-based web publishing: comparison and experience,** J. Z. Gao, S. S. Y. Shim, San Jose State Univ. . . . . [5018-27]

**CaML: camera markup language for network interaction,** J. E. Boyd, M. Sayles, X. Wu, Univ. of Calgary (Canada) . . . . . [5018-28]

**SMIL-based graphical interface for interactive TV,** S. S. Y. Shim, J. Subramani, San Jose State Univ.; Y. J. Lee, Streaming21, Inc. . . . . [5018-29]

### ✔ Posters–Wednesday

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

✔ **Application of intelligent agents in a notice and takedown process,** A. De Rosa, F. Bartolini, A. Piva, Univ. degli Studi di Firenze (Italy) . . . . . [5018-30]

✔ **XML approach for multicast video synchronization,** X. Sun, C.-C. J. Kuo, Univ. of Southern California . . . . . [5018-31]

✔ **Semantic labeling of digital photos by classification,** C. Cusano, G. Ciocca, R. Schettini, C. Brambilla, Tecnologie Informatiche Multimediali (Italy) . . . [5018-32]

✔ **Similiarity distances evaluation for query by example retrieval systems,** H. Konik, J. Da Rugna, Univ. Jean Monnet (France) . . . . . [5018-33]

✔ **Image database navigation,** N. Boukala, B. Cannon, H. Konik, Univ. Jean Monnet (France) . . . . . [5018-34]

✔ **Machine learning-based approach for web image classification,** S. Cho, D. Lee, D. Han, C. J. Hwang, Electronics and Telecommunications Research Institute (Korea) . . . . . [5018-35]

Order Proceedings now and take advantage of the special prepublication price: $60

*Proceedings V*olume 5018 will be available onsite.

*See p. 71 to order.*

# Conference 5019

Thursday 23-Friday 24 January 2003 • *Proceedings* Vol. 5019

# Multimedia Computing and Networking 2003

*In cooperation with:* ACM SIGMultimedia

*Conference Chair:* **Ragunathan Rajkumar**, Carnegie Mellon Univ.

*Program Committee:* **Tarek F. Abdelzaher**, Univ. of Virginia; **Ricardo Bettati**, Texas A&M Univ.; **Scott Brandt**, Univ. of California/Santa Cruz; **Milind M. Buddhikot**, Lucent Technologies/Bell Labs.; **Surendar Chandra**, Univ. of Georgia; **Tzi-cker Chiueh**, SUNY/Stony Brook; **Carsten Griwodz**, Univ. of Oslo (Norway); **Kevin Jeffay**, Univ. of North Carolina/Chapel Hill; **Martin G. Kienzle**, IBM Corp.; **Tei-Wei Kuo**, National Taiwan Univ. (Taiwan); **Sue B. Moon**, Sprint Advanced Technology Labs.; **Daniel Mosse**, Univ. of Pittsburgh; **Klara Nahrstedt**, Univ. of Illinois/Urbana-Champaign; **Venkata N. Padmanabhan**, Microsoft Research; **P. Venkat Rangan**, Univ. of California/San Diego; **Daniel Rubenstein**, Columbia Univ.; **Douglas C. Schmidt**, DARPA and Univ. of California/Irvine; **Srini Seshan**, Carnegie Mellon Univ.; **Prashant J. Shenoy**, Univ. of Massachusetts/Amherst; **Cormac J. Sreenan**, Univ. of Cork (Ireland); **Yoshito Tobe**, Tokyo Denki Univ. (Japan); **Hide Tokuda**, Keio Univ. (Japan); **P. Venkatram**, Indian Institute of Science (India); **Michael Vernick**, Lucent Technologies/Bell Labs.; **Dongyan Xu**, Purdue Univ.; **Rajendra Yavatkar**, Intel Corp.; **Michael Zink**, Technische Univ. Darmstadt (Germany)

## Thursday 23 January

**Plenary Speaker** ..... **Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

**SESSION 1** ..... **Thurs. 9:30 to 10:30 am**

### Multimedia Adaptation Services

**Design and evaluation of a cross-layer adaptation framework for mobile multimedia systems,** W. Yuan, K. Nahrstedt, S. Adve, D. L. Jones, R. H. Kravets, Univ. of Illinois/Urbana-Champaign ..... [5019-1]

**ICAP solution to Internet content adaptation for pervasive computing,** W. L. Tam, K. Chan, T. S. Yum, A. C. F. Chan, Chinese Univ. of Hong Kong (Hong Kong) ..... [5019-2]

**Efficient synchronization mechanism adapting to heterogeneous transmission delay in networked virtual environments,** E. Hong, D. Lee, E. Park, M. Lim, S. Han, Information and Communications Univ. (South Korea) ..... [5019-3]

**Keynote Session** ..... **Thurs. 11:00 am to noon**

Lunch/Exhibition Break

**SESSION 2** ..... **Thurs. 2:00 to 3:00 pm**

### Error Coding and Transcoding

**Retransmission-based error control in a many-to-many client-server environment,** R. Zimmerman, N. Nahata, C. Shahabi, Univ. of Southern California ..... [5019-4]

**Server transcoding of multimedia data for cross-disability access,** V. Balasubramanian, N. Venkatasubramanian, Univ. of California/Irvine ..... [5019-5]

**tgw: a webcast transcoding gateway,** T. Fitz, Univ. of California/Berkeley .. [5019-6]

**SESSION 3** ..... **Thurs. 3:30 to 4:30 pm**

### Multimedia QoS and Performance

**Quality of service monitoring in multimedia network,** G. Mao, D. Habibi, F. Safaei, Univ. of Wollongong (Australia) ..... [5019-7]

**Predicting the performance of multimedia systems using network characterization and emulation,** D. Gutierrez, A. Shah, D. Harris, Stanford Univ. ..... [5019-8]

**Providing QoS guarantees in video servers with VBR multiresolution video,** R. S. Grover, Q. Li, Santa Clara Univ. ..... [5019-9]

## Friday 24 January

**SESSION 4** ..... **Fri. 9:30 to 10:30 am**

### Media Distribution

**Analysis of a hybrid architecture for cost-effective streaming media distribution,** D. Xu, H. Chai, C. Rosenberg, S. Kulkarni, Purdue Univ. ..... [5019-10]

**Scalable TCP-friendly video distribution for heterogeneous clients,** M. Zink, C. Griwodz, J. Schmitt, R. Steinmetz, Technische Univ. Darmstadt ..... [5019-11]

**Design and implementation of an active video distribution system,** A. Neogi, IBM India Research Lab. (India); T. Chiueh, SUNY/Stony Brook ..... [5019-12]

**SESSION 5** ..... **Fri. 11:00 am to 12:00 pm**

### Multimedia Authoring and Delivery

**MPEG-7 multimedia data cartridge,** M. Doeller, H. Kosch, Univ. Klagenfurt (Germany) ..... [5019-13]

**Posting protocol for improved keyword search success in peer-to-peer file sharing systems,** L. M. Clay, M. H. Ammar, Georgia Institute of Technology; E. W. Zegura, R. J. Clark, Georgia Institute of Technology ..... [5019-14]

**Overlay caching scheme for overlay network,** M. Tran, W. Tavanapong, Iowa State Univ. ..... [5019-15]

Lunch Break

**SESSION 6** ..... **Fri. 2:00 to 3:00 pm**

### Multimedia Streaming

**Proxy-based asynchronous multicast for efficient on-demand media distribution,** Y. Cui, K. Nahrstedt, Univ. of Illinois/Urbana-Champaign ..... [5019-16]

**Proxy-assisted power-friendly streaming to mobile devices,** P. J. Shenoy, P. Radkov, Univ. of Massachusetts/Amherst ..... [5019-17]

**Efficient buffer management for scalable media-on-demand,** M. Waldvogel, IBM Zurich Research Lab. (Switzerland); W. Deng, R. Janakiraman, Washington Univ. ..... [5019-18]

**SESSION 7** ..... **Fri. 3:30 to 4:30 pm**

### Multimedia Broadcast Schemes

**Efficient VOD broadcasting scheme with user bandwidth limit,** E. Yan, T. Kameda, Simon Fraser Univ. (Canada) ..... [5019-19]

**Variable bandwidth broadcasting protocol for video-on-demand,** J. Paris, D. D. E. Long, Univ. of Houston ..... [5019-20]

**Periodic broadcast protocol for heterogeneous receivers,** K. A. Hua, O. Bagouet, D. Oger, Univ. of Central Florida ..... [5019-21]

Order Proceedings now and take advantage of the special prepublication price: $53

*Proceedings V*olume 5019 will be available onsite.

*See p. 71 to order.*

# Conference 5020

Tuesday–Friday 21–24 January 2003 • *Proceedings* Vol. 5020

# Security and Watermarking of Multimedia Contents V

*Conference Chairs:* **Edward J. Delp III,** Purdue Univ.; **Ping W. Wong,** IDzap LLC

*Program Committee:* **Adnan M. Alattar,** Digimarc Corp.; **Jeffrey A. Bloom,** Sarnoff Corp.; **Gordon W. Braudaway,** IBM Thomas J. Watson Research Ctr.; **Shih-Fu Chang,** Columbia Univ.; **Ingemar J. Cox,** NEC Research Institute; **Jana Dittmann,** Platanista and HWTK Leipzig (Germany); **Ahmet M. Eskicioglu,** CUNY/Brooklyn College; **Jessica Fridrich,** SUNY/Binghamton; **Ton Kalker,** Philips Research Eindhoven and Technical Univ. Eindhoven (Netherlands); **C.-C. Jay Kuo,** Univ. of Southern California; **Martin Kutter,** AlpVision SARL (Switzerland); **Benoit M. Macq,** Univ. Catholique de Louvain (Belgium); **Nasir D. Memon,** Polytechnic Univ.; **Pierre Moulin,** Univ. of Illinois/Urbana-Champaign; **Fabien A. Petitcolas,** Microsoft Research (UK); **Christine I. Podilchuk,** Lucent Technologies/Bell Labs.; **Ahmed H. Tewfik,** Univ. of Minnesota; **Minerva M. Yeung,** Intel Corp.

## Tuesday 21 January

### SESSION 1 . . . . . Tues. 8:30 to 11:10 am

#### Audio

**High-capacity reversible watermarking for audio,** F. Bruekers, M. van der Veen, S. Cavin, Philips Research Labs. (Netherlands) . . . . . [5020-01]

**Robustness evaluation of transactional audio watermarking systems,** C. Neubauer, Fraunhofer-Institut für Integrierte Schaltungen (Germany); M. Steinebach, Fraunhofer-Institut für Integrierte Publikations-und Informationssysteme (Germany); F. Siebenhaar, J. Pickel, Fraunhofer-Institut für Integrierte Schaltungen (Germany) . . . . . [5020-02]

**Robust audio watermark method using sinusoid patterns based on pseudo-random sequences,** Z. Liu, Y. Kobayashi, S. Sawato, A. Inoue, M.Ken Co., Ltd. (Japan) . . . . . [5020-03]

**Audio watermarking for live performance,** R. Tachibana, IBM Japan Ltd. (Japan) . . . . . [5020-04]

**Audio watermarking special session: high-capacity MPEG-1 audio layer 2 watermarking,** M. Steinebach, Fraunhofer-Institut für Integrierte Publikations-und Informationssysteme (Germany); J. Dittmann, Platanista GmbH (Germany) [5020-05]

**Audio steganalysis with statistical distance metrics,** N. D. Memon, Polytechnic Univ.; I. Avcibas, B. Sankur, Y. Yigit, O. Kahya, Bogazici Univ. (Turkey) . . . . . [5020-06]

**Audio steganography by amplitude or phase modification,** K. Gopalan, Purdue Univ.; S. J. Wenndt, S. F. Adams, D. M. Haddad, Air Force Research Lab. . . . . [5020-07]

### SESSION 2 . . . . . Tues.11:10 am to 12:50 pm

#### Perceptual Techniques

**Perceptual mask estimation from watermarked images,** S. Ventosa, E. Sayrol, Univ. Politecnica de Catalunya (Spain) . . . . . [5020-08]

**Automatic perceptual quality evaluation of geometrically distorted images using relevant geometric transformation modeling,** I. Setyawan, Technische Univ. Delft (Netherlands); D. Delannay, B. M. Macq, Univ. Catholique de Louvain (Belgium); R. L. Lagendijk, Technische Univ. Delft (Netherlands) . . . . . [5020-09]

**Exploring effective coefficients in perceptual watermarking,** C. W. Tang, H. M. Hang, National Chiao Tung Univ. (Taiwan) . . . . . [5020-10]

**Watermark strength determination based on a new contrast masking model,** A. Saadane, Ecole Polytechnique de l'Univ. de Nantes (France) . . . . . [5020-11]

**Merging robustness and perceptual distortion in a decision-theoretic framework,** J. Picard, MediaSec Technologies . . . . . [5020-12]

Lunch Break

Order Proceedings now and take advantage of the special prepublication price: $100

*Proceedings V*olume 5020.

*See p. 71 to order.*

### SESSION 3 . . . . . Tues. 2:10 to 5:40 pm

#### Steganalysis

**Active steganalysis,** R. Chandramouli, Stevens Institute of Technology . . . [5020-13]

**Steganalysis of additive noise modelable information hiding,** J. J. Harmsen, W. A. Pearlman, Rensselaer Polytechnic Institute . . . . . [5020-14]

**New methodology for breaking steganographic techniques for JPEGs,** J. Fridrich, M. Goljan, D. Hogea, SUNY/Binghamton . . . . . [5020-15]

**Information theoretic approach to security of digital steganographic systems using phase modulation,** F. T. Alturki, College of Technological Studies (Kuwait) . [5020-16]

**Steganographic system based on higher-order statistics,** R. Tzschoppe, R. Bäuml, J. Huber, Friedrich-Alexander Univ.-Erlangen-Nürnberg (Germany) . . . . . [5020-17]

**SmartSearch steganalysis,** J. A. Bloom, R. Alonso, Sarnoff Corp. . . . . [5020-18]

**Steganography capacity: a steganalysis perspective,** R. Chandramouli, Stevens Institute of Technology; N. D. Memon, Polytechnic Univ. . . . . [5020-19]

**Higher order statistical steganalysis of palette images,** J. Fridrich, D. Soukal, M. Goljan, SUNY/Binghamton . . . . . [5020-20]

**Digital image steganography using stochastic modulation,** J. Fridrich, M. Goljan, Binghamton Univ. . . . . [5020-21]

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

### SESSION 4 . . . . . Wed. 9:30 to 10:30 am

#### Benchmarking

**Optimized selection of benchmark test parameters for image watermark algorithms via Taguchi methods and their influence on design decisions for real-world applications,** T. F. Rodriguez, Digimarc Corp. . . . . [5020-22]

**Watermarking evaluation: an update,** E. J. Delp III, Purdue Univ. . . . . [5020-23]

### SESSION 5 . . . . . Wed.10:50 am to 12:10 pm

#### Biometrics and Smart Cards

**Signal processing for smart cards,** J. J. Quisquater, D. Samyde, Univ. Catholique de Louvain (Belgium) . . . . . [5020-24]

**Applications of a hologram watermarking protocol: aging-aware biometric signature verification and time validity check with personal documents,** C. Vielhauer, Technische Univ. Darmstadt and Platanista GmbH (Germany); L. Croce Ferri, Fraunhofer-Institut für Integrierte Publikations- und Informationssysteme (Germany); J. Dittmann, HTWK Leipzig and Platanista GmbH (Germany) . . . . . [5020-25]

**Implementation of ID card system using optodigital information hiding scheme,** E. S. Kim, J. J. Kim, Kwangwoon Univ. (Korea) . . . . . [5020-26]

**Embedding of biometric information in small images,** N. Ishaq Qazi, SUNY Institute of Technology; R. J. Simard, S. F. Adams, Air Force Research Lab. . . . . [5020-27]

Lunch/Exhibition Break

## SESSION 6 ..... Wed. 1:40 to 5:50 pm

### Embedding and Detection

**Applications of blurring filters to improve detection of invisible image watermarks,** G. W. Braudaway, F. C. Mintzer, IBM Thomas J. Watson Research Ctr. .....[5020-28]

**Widespread spectrum watermarking with side information and interference cancelation,** G. Le Guelvouit, S. Pateux, IRISA/INRIA (France) .....[5020-29]

**Advantages and drawbacks of multiplicative spread spectrum watermarking,** M. Barni, Univ. degli Studi di Siena (Italy); F. Bartolini, A. De Rosa, Univ. degli Studi di Firenze (Italy) .....[5020-30]

**Watermarking of Wigner transform,** B. G. Mobasseri, Villanova Univ. .....[5020-31]

**Polynomial detectors for side-informed image watermarking,** G. C. M. Silvestre, N. J. Hurley, Univ. College Dublin (Ireland) .....[5020-32]

**Watermark detection algorithm in multimedia using statistical decision theory,** S. G. Kwon, Kyungpook National Univ. (Korea); K. R. Kwon, Pusan Univ. of Foreign Studies (Korea); K. I. Lee, Kyungpook National Univ. (Korea) .....[5020-33]

**TurboWm: enhanced robustness in image watermarking using turbo codes,** C. Rey, J. Dugelay, Institut Eurecom (France); K. Amis, A. Picart, R. Pyndiah, Ecole Nationale Supérieure des Télécommunications de Bretagne (France) .....[5020-34]

**Three-dimensional watermarking design evaluation,** J. Dittmann, HTWK Leipzig and Platanista GmbH (Germany); O. Benedens, Freelance Researcher (Germany); F. A. P. Petitcolas, Microsoft Research Cambridge (UK) .....[5020-35]

**Autocorrelation function-based watermarking with side information,** C. H. Lee, H. K. Lee, Korea Advanced Institute of Science and Technology (Korea); Y. Suh, Electronics and Telecommunications Research Institute (Korea) .....[5020-36]

**Feature-based watermarking of 2D vector data,** M. Voigt, Technische Univ. Darmstadt (Germany); C. Busch, Fraunhofer Institut für Graphische Datenverarbeitung (Germany) .....[5020-37]

**Informed digital watermark embedding based on guided scrambling,** A. Kunisa, Sanyo Electric Co., Ltd. (Japan) .....[5020-38]

## Thursday 23 January

**Plenary Speaker ..... Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

## SESSION 7 ..... Thurs. 9:30 am to Noon

### Applications

**Analysis of data hiding technologies for medical images,** A. Piva, F. Bartolini, I. Coppini, A. De Rosa, Univ. degli Studi di Firenze (Italy); E. Tamburini, MEDEA (Italy) .....[5020-39]

**Real-time watermarking techniques for sensor networks,** M. Potkonjak, J. Fang, Univ. of California/Los Angeles .....[5020-40]

**Music score watermarking by clef modifications,** M. Schmucker, H. Yan, Fraunhofer-Institut für Graphische Datenverarbeitung (Germany) .....[5020-41]

**Visible encryption: using paper as a secure channel,** F. Peréz-González, N. Degara-Quintela, Univ. de Vigo (Spain) .....[5020-42]

**Multiresolution binary image embedding,** P. W. Wong, Consultant .....[5020-43]

**Watermarking spot colors,** O. Alattar, A. M. Reed, Digimarc Corp. .....[5020-44]

Lunch/Exhibition Break

Order Proceedings now and take advantage of the special prepublication price: $100

*Proceedings V*olume 5020.

*See p. 71 to order.*

## SESSION 8 ..... Thurs. 1:30 to 5:00 pm

### Video

**Evaluation of watermarking low bit-rate MPEG-4 bit streams,** A. M. Alattar, Digimarc Corp. .....[5020-45]

**Authentication of MPEG-4: risks and solutions,** A. Lang, S. Thiemert, Fraunhofer-Institut für Integrierte Publikations- und Informationssysteme (Germany); F. A. P. Petitcolas, Microsoft Research Cambridge (UK) .....[5020-46]

**Video watermarking system using selection and overlapping of region by features of consecutive frames,** H. Lee, J. Hong, Electronics and Telecommunications Research Institute (Korea) .....[5020-47]

**Watermark recovery from 2D views of a 3D video object,** E. Garcia, J. Dugelay, Institut Eurecom (France) .....[5020-48]

**Temporal alignment of video sequences for watermarking systems,** D. Delannay, C. de Roover, B. M. Macq, Univ. Catholique de Louvain (Belgium) .....[5020-49]

**Temporal synchronization in video watermarking: further studies,** E. T. Lin, E. J. Delp III, Purdue Univ. .....[5020-50]

**Robust video watermarking using spatial and temporal synchronization,** J. Du, C. H. Lee, H. K. Lee, Korea Advanced Institute of Science and Technology (Korea); Y. Suh, Electronics and Telecommunications Research Institute (Korea) .....[5020-51]

**Protection of multicast scalable video by secret sharing: simulation results,** A. M. Eskicioglu, CUNY/Brooklyn College; E. J. Delp III, Purdue Univ. .....[5020-52]

**Key-based video watermarking system on MPEG-2,** S. J. Weng, T. T. Lu, P. C. Chang, National Central Univ. (Taiwan) .....[5020-53]

## Friday 24 January

## SESSION 9 ..... Fri. 8:30 to 10:30 am

### Digital Cinema

**Watermarking and digital camera,** A. van Leest, J. Haitsma, T. Kalker, Philips Research Labs. (Netherlands) .....[5020-54]

**Robust second-generation watermark for tracking in digital cameras,** J. Lubin, J. A. Bloom, Sarnoff Corp. .....[5020-55]

**Watermarking requirements for Boeing digital cinema,** J. P. Lixvar, Boeing Co. .....[5020-56]

**Registration methods for non-blind watermark detection in digital cinema applications,** P. Nguyen, Thales Communications (France); R. Balter, IRISA (France); N. Montfort, S. Baudry, Thales Communications (France) .....[5020-57]

**Digital rights language support for evolving D-cinema requirements,** X. Orri, J. M. Mas, Octalis S.A. (Belgium); B. M. Macq, Univ. Catholique de Louvain (Belgium) .....[5020-58]

**Robust watermarking of digital video/movie using semantic redundancy,** X. Wu, McMaster Univ. (Canada) .....[5020-59]

## Friday 24 January

## SESSION 10 ..... Fri.10:50 am to 12:50 pm

### Theoretical Methods

**Data hiding capacity-security analysis for real images based on stochastic non-stationary geometrical models,** S. V. Voloshynovskiy, O. Koval, F. Deguillaume, T. Pun, Univ. de Genève (Switzerland) .....[5020-60]

**Limits of error correction coding in spread spectrum video watermarking,** M. Ambroze, M. Tomlinson, C. Serdean, Univ. of Plymouth (UK); G. Wade, Univ. of Newcastle (Australia) .....[5020-61]

**Capacity bounds and code constructions for reversible data-hiding,** T. Kalker, F. M. Willems, Philips Research Eindhoven and Technische Univ. Eindhoven (Netherlands) .....[5020-62]

**Optimality of SCS watermarking,** R. Baeuml, R. Tzschoppe, J. Huber, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany) .....[5020-63]

**Hexagonal quantizers are not optimal for 2D data hiding,** F. Peréz-González, F. Balado, Univ. de Vigo (Spain) .....[5020-64]

**New wrinkle in dirty paper techniques,** B. A. Bradley, J. Stach, H. Brunk, Digimarc Corp. .....[5020-65]

Lunch Break

**SESSION 11 . . . . . Fri. 2:00 to 3:40 pm**

### Authentication

**Security of visual hash function,** R. Radhakrishnan, Polytechnic Univ.; Z. Xiong, Univ. of Illinois/Urbana-Champaign; N. D. Memon, Polytechnic Univ. . . . . [5020-66]

**Invertible authentication for 3D meshes,** J. Dittmann, HTWK Leipzig and Platanista GmbH (Germany); O. Benedens, Fraunhofer-Institut für Graphische Datenverarbeitung (Germany) . . . . . [5020-67]

**New alteration detecting technique for printed documents using dot pattern watermarking,** M. Suzaki, Y. Mitsui, M. Suto, Oki Electric Industry Co., Ltd. (Japan) . . . . . [5020-68]

**Advanced techniques for dispute resolving and authorship proofs on digital works,** A. Adelsbach, A. Sadeghi, Univ. des Saarlandes (Germany) . . . . . [5020-69]

**Lossless authentication watermark (LAW),** M. U. Celik, Univ. of Rochester; G. Sharma, Xerox Corp.; A. M. Tekalp, Koc Univ. (Turkey) and Univ. of Rochester; E. S. Saber, Xerox Corp. . . . . [5020-70]

**SESSION 12 . . . . . Fri. 4:00 to 5:20 pm**

### Embedding and Detection II

**Host-aware watermark embedding techniques for use with correlation-based receivers,** H. Brunk, Digimarc Corp. . . . . [5020-71]

**Oblivious image watermarking combined with JPEG compression,** Q. Chen, H. Maitre, B. Pesquet-Popescu, Ecole Nationale Supérieure des Télécommunications (France) . . . . . [5020-72]

**Empirical evaluation of a JPEG2000 standard-based robust watermarking scheme,** J. Minguillon, J. Herrera, D. Megias, Univ. Oberta de Catalunya (Spain) . . . . . [5020-73]

**Key-dependent pyramidal wavelet domains for secure watermark embedding,** W. M. Dietl, P. Meerwald, A. Uhl, Paris-Lodron-Univ. Salzburg (Austria) . . . . . [5020-74]

**Register by 20 December 2002 and save US $100!**

**Register online!**

Order Proceedings now and take advantage of the special prepublication price: $100

*Proceedings V*olume 5020.

*See p. 71 to order.*

# Conference 5021

Wednesday–Friday 22–24 January 2003 • *Proceedings* Vol. 5021

# Storage and Retrieval for Media Databases 2003

*Conference Chairs:* **Minerva M. Yeung, Rainer W. Lienhart,** Intel Corp.; **Chung-Sheng Li,** IBM Thomas J. Watson Research Ctr.

*Program Committee:* **Charles A. Bouman,** Purdue Univ.; **Edward Y. Chang,** Univ. of California/Santa Barbara; **Shih-Fu Chang,** Columbia Univ.; **Yen-Kuang Chen,** Intel Corp.; **Edward J. Delp III,** Purdue Univ.; **Nevenka Dimitrova,** Philips Research; **Wolfgang Effelsberg,** Univ. Mannheim (Germany); **Stephan Fischer,** Mobile VideoCommunication AG (Germany); **Arun Hampapur,** IBM Thomas J. Watson Research Ctr.; **Alan Hanjalic,** Delft Univ. of Technology (Netherlands); **Anil K. Jain,** Michigan State Univ.; **Shih-Ping Liou,** Siemens Corp. Research, Inc.; **Wei-Ying Ma,** Microsoft Research China; **Bernard Merialdo,** Institut Eurécom (France); **Silvia Pfeiffer,** Univ. Mannehim (Australia); **Dulce B. Ponceleon,** IBM Almaden Research Ctr.; **Simone Santini,** Univ. of California/San Diego; **John R. Smith,** IBM Thomas J. Watson Research Ctr.; **Ahmed H. Tewfik,** Univ. of Minnesota; **A. Murat Tekalp,** Univ. of Rochester; **Shiqiang Yang,** Tsinghua Univ.; **Aidong Zhang,** SUNY/Buffalo; **Hongjiang Zhang,** Microsoft Research China

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

### SESSION 1 . . . . . Wed. 9:30 to 10:30 am

**Search and Retrieval of Image Databases**

**Visual interfaces for a semantic content-based image retrieval system,** H. Z. Hel-Or, Univ. of Haifa (Israel); D. Dori, Technion—Israel Institute of Technology (Israel) . . . . . [5021-01]

**Managing and searching personal photo collections,** U. Gargi, Y. Deng, D. R. Tretter, Hewlett-Packard Labs. . . . . [5021-02]

**Selecting image retrieval parameters with a genetic algorithm,** B. I. Soroka, S. P. Kerrick, California State Polytechnic Univ./Pomona . . . . . [5021-03]

### SESSION 2 . . . . . Wed.11:00 am to Noon

**Shape/Texture-based Image Retrieval**

**Shape-based image retrieval method using integrated salient edge matching,** J. W. Han, L. Guo, Northwestern Polytechnical Univ. (China) . . . . . [5021-04]

**Searching in image and animation databases using shape description,** P. L. Stanchev, Kettering Univ. . . . . [5021-05]

**Image object search combining color with Gabor wavelet shape descriptions,** D. Anderson, M. S. Drew, Simon Fraser Univ. (Canada) . . . . . [5021-06]

Lunch/Exhibition Break

### SESSION 3 . . . . . Wed. 1:30 to 3:10 pm

**Semantic-based Search and Retrieval of Images**

**Semantic image browsing using hidden categories,** J. Stauder, G. Gouzien, B. Chupeau, L. Nunez, J. R. Vigouroux, Thomson Multimedia (France) . . . . . [5021-07]

**Novel approach to integrate the feature contrast model in visual information retrieval systems,** H. Eidenberger, C. Breiteneder, Technische Univ. Wien (Austria) . . . . . [5021-08]

**Implementation of bias competition model for feature element-based image retrieval,** Y. Xu, Y. Zhang, Tsinghua Univ. (China) . . . . . [5021-09]

**Role of classifiers in multimedia content management,** M. R. Naphade, J. R. Smith, IBM Thomas J. Watson Research Ctr. . . . . [5021-10]

**Semantics reinforced multimedia categorization,** A. H. Salden, S. M. Iacob, R. Aldershoff, Telematica Instituut (Netherlands) . . . . . [5021-11]

### ✔ Posters–Wednesday

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

✔ **Evaluation of shape indexing methods for content-based retrieval of x-ray images,** S. Antani, L. R. Long, G. R. Thoma, National Library of Medicine; D. J. Lee, Brigham Young Univ. . . . . [5021-44]

✔ **Multimedia human brain database system for surgical candidacy determination in temporal lobe epilepsy with content-based image retrieval,** M. R. Siadat, Wayne State Univ.; H. Soltanian-Zadeh, Henry Ford Health System; F. A. Fotouhi, Wayne State Univ.; K. Elisevich, Henry Ford Health System . . . . . [5021-45]

✔ **Storage analysis and comrpession of signals with application in medicine,** V. I. Ponomaryov, L. Badillo, C. Juarez, J. Sanchez, Instituto Politecnico Nacional (Mexico); L. Igartua, Instituto Nacional de Neurologia y Neurocirugia (Mexico) . . . . . [5021-46]

✔ **GRA-based relevance feedback technique for content-based image retrieval,** K. Cao, Y. Feng, Huazhong Univ. of Science and Technology (China) . . . . . [5021-47]

✔ **Novel algorithm in relevance feedback in region-based image retrieval system,** X. Peng, S. Ma, Z. Su, L. Ru, Tsinghua Univ. (China) . . . . . [5021-48]

✔ **Effective and simple relevance feedback algorithm for image retrieval,** X. Xue, N. Yang, Fudan Univ. (China) . . . . . [5021-49]

✔ **Novel index structure for fast similarity retrieval,** K. Cao, Y. Feng, Huazhong Univ. of Science and Technology (China) . . . . . [5021-50]

✔ **Selecting materialized views in a data warehouse,** L. Zhou, C. Liu, D. Liu, Harbin Engineering Univ. and Harbin Institute of Science and Technology (China)[5021-51]

✔ **Unsupervised learning of arbitrarily shaped clusters with application to image data base categorization,** H. Frigui, Univ. of Memphis . . . . . [5021-52]

✔ **New anchor selection methods for image retrieval,** A. Natsev, J. R. Smith, IBM Thomas J. Watson Research Ctr. . . . . [5021-53]

✔ **Improving image retrieval performance by integrating long-term learning with short-term learning,** J. W. Han, L. Guo, Northwestern Polytechnical Univ. (China) . . . . . [5021-54]

Order Proceedings now and take advantage of the special prepublication price: $80

*Proceedings V*olume 5021 will be available onsite.

*See p. 71 to order.*

## Thursday 23 January

**Plenary Speaker** ..... **Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

### SESSION 4 ..... Thurs. 9:30 to 10:30 am

**Special Session: Audio Processing I**

*Chair:* **Silvia Pfeiffer,** CSIRO (Australia)

**Similarity matching of continuous melody contours for humming querying of melody databases,** Y. Zhu, Labs. for Information Technologies (Singapore); M. S. Kankanhalli, National Univ. of Singapore; Q. Tian, Labs. for Information Technologies (Singapore) ..... [5021-12]

**Analysis of musical expression in audio signals,** S. Dixon, Austrian Research Institute for Artificial Intelligence (Austria) ..... [5021-13]

**Survey of compressed domain audio features and their expressiveness,** S. Pfeiffer, CSIRO (Australia); T. Vincent, Institut National Polytechnique de Grenoble (France) ..... [5021-14]

### SESSION 5 ..... Thurs.11:00 am to Noon

**Special Session: Audio Processing II**

*Chair:* **Silvia Pfeiffer,** CSIRO (Australia)

**Video retrieval using speech and image information,** A. Hauptmann, R. Jin, Carnegie Mellon Univ. ..... [5021-15]

**Procedure for audio-assisted browsing of news video using generalized sound recognition,** A. Divakaran, R. Radhakrishnan, Mitsubishi Electric Research Labs. ..... [5021-16]

**Media segmentation using self-similarity decomposition,** J. T. Foote, FX Palo Alto Laboratory, Inc. ..... [5021-17]

Lunch/Exhibition Break

### SESSION 6 ..... Thurs. 1:30 to 3:10 pm

**Emerging Topics in Media Information Systems**

**Image copy detection using dynamic partial function,** Y. Meng, E. Y. Chang, Univ. of California/Santa Barbara ..... [5021-18]

**Multimedia technology infrastructure for emerging peer-to-peer applications and services,** R. W. Lienhart, M. J. Holliman, Y. K. Chen, I. V. Kozintsev, M. M. Yeung, Intel Corp. ..... [5021-19]

**Ordinal measure of DCT coefficients for image correspondence and its application to copy detection,** C. Kim, Epson Palo Alto Lab. ..... [5021-20]

### SESSION 7 ..... Thurs. 3:40 to 5:20 pm

**Image Features**

**Feature point extraction in compressed domain,** B. Besserer, R. Coudary, Univ. de La Rochelle (France) ..... [5021-22]

**Attention-based image similarity measure with application to content-based information retrieval,** F. Stentiford, Univ. College London (UK) ..... [5021-23]

**Image retrieval based on histogram of new fractal codes,** M. Pi, Univ. of Alberta (Canada) ..... [5021-24]

**Efficient color image retrieval using hue distribution similarity,** S. H. Cha, Pace Univ. ..... [5021-25]

**Comprehensive progressive decoding for JPEG compressed image,** G. Feng, Univ. of Bradford (UK) and Zhongshan Univ. (China); J. Jiang, Univ. of Bradford (UK) [5021-26]

## Friday 24 January

### SESSION 8 ..... Fri. 8:35 to 10:10 am

**Video Processing**

**Method for news video scene segmentation based on events stream,** J. Xu, D. Zhou, Wuhan Univ. (China) ..... [5021-27]

**Rule-based dialog and action scene (one-on-one fighting) extraction from movies,** L. Chen, M. T. Ozsu, Univ. of Waterloo (Canada) ..... [5021-28]

**Integrated video shot segmentation algorithm,** W. K. Li, S. H. Lai, National Tsing Hua Univ. (Taiwan) ..... [5021-29]

**Automatic extraction of soccer video highlights using a combination of motion and audio features,** R. Cabasson, A. Divakaran, Mitsubishi Electric Research Labs. ..... [5021-31]

### SESSION 9 ..... Fri.10:30 am to 12:10 pm

**Classification of Video Sequences**

**Context-enhanced video understanding,** A. Jaimes, Columbia Univ. and IBM Thomas J. Watson Research Ctr.; M. R. Naphade, B. L. Tseng, J. R. Smith, IBM Thomas J. Watson Research Ctr. ..... [5021-32]

**Temporal structure analysis of broadcast tennis video using hidden Markov models,** E. Kijak, Thomson Multimedia (France); P. Gros, IRISA (France); L. Oisel, Thomson Multimedia (France) ..... [5021-33]

**Semantic shots categorization of sports video,** L. Y. Duan, M. Xu, Q. Tian, National Univ. of Singapore ..... [5021-34]

**Bridging the semantic gap in sports,** B. Li, J. Errico, H. Pan, M. Sezan, Sharp Labs. of America ..... [5021-35]

**Framework for detecting hazardous events,** Y. Wu, E. Y. Chang, Univ. of California/ Santa Barbara ..... [5021-36]

Lunch Break

### SESSION 10 ..... Fri. 1:30 to 2:30 pm

**Video Retrieval Systems**

**Real-time hierarchical soccer video summarization and event detection,** A. Ekin, Univ. of Rochester; A. Tekalp, Koc Univ. (Turkey) and Univ. of Rochester ... [5021-37]

**Designing a metadata repository for a digital interactive television (digiTV) feedback channel network,** A. R. Lugmayr, S. Kalli, A. Mailaparampil, Tampere Univ. of Technology (Finland) ..... [5021-38]

**Content-based MPEG video retrieval using video query based on linear approximation of content curve,** T. H. Kim, W. H. Lee, D. S. Jeong, Inha Univ. (Korea) ..... [5021-39]

### SESSION 11 ..... Fri. 2:30 to 3:50 pm

**MPEG-7 and Related Topics**

**Semantic event detection using MPEG-7,** Y. M. Ro, C. S. Kim, Information and Communications Univ. (Korea) ..... [5021-40]

**Temporal audio segmentation using MPEG-7 descriptors,** J. Wellhausen, H. Crysandt, Rheinisch-Westfälische Technische Hochschule Aachen (Germany) ..... [5021-41]

**MPEG-7 based shape retrieval with robustness against partial occlusion,** M. Hoeynck, J. R. Ohm, Rheinisch-Westfälische Technische Hochschule Aachen (Germany) ..... [5021-42]

**Music classification with MPEG-7,** H. Crysandt, J. Wellhausen, Rheinisch-Westfälische Technische Hochschule Aachen (Germany) ..... [5021-43]

Order Proceedings now and take advantage of the special prepublication price: $80

*Proceedings V*olume 5021 will be available onsite.

*See p. 71 to order.*

# Conference 5022

Tuesday–Friday 21–24 January 2003 • *Proceedings* Vol. 5022

# Image and Video Communications and Processing 2003

*Conference Chairs:* **Bhaskaran Vasudev,** Epson Palo Alto Lab.; **T. Russell Hsing,** Telcordia Technologies, Inc.; **Andrew G. Tescher,** AGT Associates; **Touradj Ebrahimi,** Swiss Federal Institute of Technology (Switzerland)

*Program Committee:* **Alan C. Bovik,** Univ. of Texas/Austin; **Tsuhan Chen,** Carnegie Mellon Univ.; **Yen-Kuang Chen,** Intel Corp.; **Edward J. Delp III,** Purdue Univ.; **Nariman Farvardin,** Univ. of Maryland/College Park; **Charles P. Fenimore,** National Institute of Standards and Technology; **Hsueh-Ming Hang,** National Chiao Tung Univ. (Taiwan); **C.-C. Jay Kuo,** Univ. of Southern California; **Ruby B. Lee,** Princeton Univ.; **Ligang Lu,** IBM Thomas J. Watson Research Ctr.; **Nader Moayeri,** National Institute of Standards and Technology; **Nasser M. Nasrabadi,** Army Research Lab.; **Antonio Ortega,** Univ. of Southern California; **Sethuraman Panchanathan,** Arizona State Univ.; **William A. Pearlman,** Rensselaer Polytechnic Institute; **Majid Rabbani,** Eastman Kodak Co.; **Kannan Ramchandran,** Univ. of California/Berkeley; **Viresh Ratnakar,** Epson Corp.; **Amir Said,** Hewlett-Packard Labs.; **Ming-Ting Sun,** Univ. of Washington; **A. Murat Tekalp,** Univ. of Rochester; **Thomas Wiegand,** Heinrich-Hertz-Institut für Nachrichtentechnik (Germany); **Zixiang Xiong,** Texas A&M Univ.; **Hongjiang Zhang,** Microsoft Research China

## Tuesday 21 January

**SESSION 1 . . . . . Tues. 1:30 to 5:30 pm**

**Special Session: Digital Cinema**

*Chair:* **Charles P. Fenimore,** National Institute of Standards and Technology

**Image compression evaluation and application for digital cinema: the case of Star Wars: Episode II,** D. L. Schnuelle, THX Ltd. . . . . [5022-01]

**Film versus digital cinema** *(Invited Paper),* M. Tinker, Sarnoff Corp. . . . . [5022-02]

**Assessment of resolution and dynamic range for digital cinema,** C. P. Fenimore, National Institute of Standards and Technology . . . . . [5022-03]

**Challenges of implementing digital technology in motion picture distribution and exhibition: testing and evaluation methodology,** C. S. Swartz, Univ. of Southern California . . . . . [5022-04]

**Breaking the barriers of ultrahigh-resolution motion imagery** *(Invited Paper),* K. Goertzen, QuVIS, Inc. . . . . [5022-06]

**Digital cinema system using JPEG2000 movie of 8-million pixel resolution** *(Invited Paper),* T. Fujii, M. Nomura, D. Shirai, T. Yamaguchi, T. Fujii, S. Ono, NTT Network Innovation Labs. (Japan) . . . . . [5022-07]

## Wednesday 22 January

**Plenary Speaker . . . . . Wed. 8:30 to 9:15 am**

**Digital Image Processing: How far are we ?**

**Murat Kunt,** Swiss Federal Institute of Technology (Switzerland)

*See pg. 4 for details.*

## Sessions 2 and 3 run concurrently.

**SESSION 2 . . . . . Wed. 9:30 am to Noon**

**Motion Analysis**

**Efficient image segmentation and its application to motion estimation,** R. B. Wittebrood, G. de Haan, Philips Research Labs. (Netherlands) . . . . . [5022-08]

**Mean field theory based motion estimation in the Lagurerre Gauss domain,** A. Neri, M. Carli, Univ. degli Studi di Roma Tre; E. de Santis, G. Iacovitti, Univ. degli Studi di Roma La Sapienza (Italy) . . . . . [5022-09]

**Estimation of multiple motions: regularization and performance evaluation,** I. Stuke, T. Aach, Univ. zu Lübeck (Germany); C. Mota, Univ. de Manaus (Brazil); E. Barth, Univ. zu Lubeck (Germany) . . . . . [5022-10]

Coffee Break

**Differential motion vector coding with application to spatial scalable coding in FGS,** R. M. Kalluri, M. van der Schaar, Philips Research Labs.; B. Pesquet-Popescu, Ecole National Supérieure des Télécommunications (France) . . . . . [5022-11]

**Robust global motion estimation from coarsely sampled motion vector fields,** Y. Su, M. T. Sun, Univ. of Washington; V. Hsu, Industrial Technology Research Institute (Taiwan) . . . . . [5022-12]

**Region-wise motion compensation technique using weighted motion vectors,** F. Ahmadianpour, O. Ahmad, Concordia Univ. (Canada) . . . . . [5022-13]

Lunch/Exhibition Break

**SESSION 3 . . . . . Wed. 9:30 am to 12:10 pm**

**Image/Video Transmission I**

**Robust video communication by combining scalability and MDC techniques,** H. Wang, A. Ortega, Univ. of Southern California . . . . . [5022-14]

**RCSS: receiver-cache and sender-smoothing layered multicast for video over networks,** Y. Ji, Y. Zhong, L. Sun, Tsinghua Univ. (China) . . . . . [5022-15]

**Error resilient video coding with error concealment and asymmetric tree structure,** S. Cho, W. A. Pearlman, Rensselaer Polytechnic Institute . . . . . [5022-16]

**Scalable architecture for multiple description video coding,** M. Fumagalli, R. C. Lancini, N. Franchi, Politecnico di Milano (Italy) . . . . . [5022-17]

**Robust error control for scalable video streaming over Internet,** G. Wang, X. Lin, S. Yang, L. Xu, Tsinghua Univ. (China) . . . . . [5022-18]

**Multiple description scalable coding for error resilient video transmission over packet networks,** Y. Liu, Purdue Univ.; P. Salama, Indiana Univ.-Purdue Univ. Indianapolis; E. J. Delp III, Purdue Univ. . . . . [5022-19]

**Error resilient wavelet-tree coding for robust image transmission,** L. Cao, Univ. of Mississippi; C. W. Chen, Sarnoff Corp. . . . . [5022-20]

Lunch/Exhibition Break

## Sessions 4 and 6 run concurrently.

### SESSION 4 . . . . . Wed. 1:30 to 3:30 pm

#### MPEG-4

**Efficient real-time MPEG-4 software video encoding for embedded multimedia systems,** L. Lu, IBM Thomas J. Watson Research Ctr.; S. Liu, Univ. of Southern California . . . . . [5022-21]

**Superresolution reconstruction of MPEG-4 coded lossy video,** G. Caner, W. Heinzelman, A. M. Tekalp, Univ. of Rochester . . . . . [5022-22]

**Efficient MPEG-2 to MPEG-4 video transcoding,** S. Liu, Univ. of Southern California; L. Lu, IBM Thomas J. Watson Research Ctr.; C.-C. J. Kuo, Univ. of Southern California . . . . . [5022-23]

**Significance analysis of MPEG-4 video syntactical elements,** A. Navarro, J. M. Tavares, Univ. de Aveiro (Portugal) . . . . . [5022-24]

**DCT-domain filtering algorithm for MPEG-4 encoding,** G. Hermant, F. Grolière, Philips Research France (France) . . . . . [5022-25]

**Motion-vector-based adaptive quantization in MPEG-4 fine granular scalable coding,** S. Yang, X. Lin, G. Wang, Tsinghua Univ. (China) . . . . . [5022-26]

### SESSION 6 . . . . . Wed. 1:30 to 3:30 pm

#### Image/Video Transmission II

**Layered video transmission over multirate DS-CDMA wireless systems,** L. P. Kondi, D. Srinivasan, D. A. Pados, S. N. Batalama, Univ. at Buffalo . . . . . [5022-33]

**Unbalanced quantized multiple description video transmission using path diversity,** S. Ekmekci, Technische Univ. Berlin (Germany); M. Flierl, Stanford Univ.; T. Sikora, Technische Univ. Berlin (Germany) . . . . . [5022-34]

**Metadata-based video-on-demand transmission under network supporting QoS renegotiations,** H. Song, D. B. Lee, Hong-Ik Univ. (Korea) . . . . . [5022-35]

**Practical estimation techniques of traffic specification for VBR video services,** T. C. Thang, Y. M. Ro, Information and Communications Univ. (Korea) . . . . . [5022-36]

**Effective video redundancy coding scheme with respect to channel error and network utilization,** H. Song, Hong-Ik Univ. (Korea) . . . . . [5022-37]

**Scalable video transmission over priority network,** F. Yu, G. Wang, X. Lin, Tsinghua Univ. (China) . . . . . [5022-38]

## Sessions 5 and 7 run concurrently.

### SESSION 5 . . . . . Wed. 3:50 to 5:50 pm

#### Implementations

**Implementation of H.26L decoder on general-purpose processors with media instructions,** X. Zhou, Purdue Univ.; Y. K. Chen, Intel Corp. . . . . [5022-27]

**Multiresolution block matching algorithm and its LSI architecture for fast motion estimation in MPEG-2 video encoder,** B. C. Song, K. W. Chun, Samsung Electronics Co., Ltd. (Korea) . . . . . [5022-28]

**Low-complexity perceptual post-processing of MPEG-4 sequences,** J. Jung, Y. Le Maguet, J. Gobert, S. Delcorso, Philips Research France (France) . . . . . [5022-29]

**New scalable systolic array processor architecture for simultaneous discrete convolution of k different (n x n) filter coefficient planes with a single image plane,** J. R. Heath, A. T. Wong, Univ. of Kentucky; M. E. Lhamon, Lexmark International, Inc. . . . . [5022-30]

**Analysis of area-time efficiency for an integrated focal plane architecture,** W. H. Robinson, D. S. Wills, Georgia Institute of Technology . . . . . [5022-31]

**Speeding up the optimization of the rate distortion performance in MPEG-2 video coding through quantizer loop parameterization,** C. Grecos, A. Saparon, Loughborough Univ. (UK) . . . . . [5022-32]

### SESSION 7 . . . . . Wed. 3:50 to 5:50 pm

#### Image/Video Transmission III

**Real-time multipass MPEG video coding for video-on-demand over ADSL,** L. Lu, IBM Thomas J. Watson Research Ctr. . . . . [5022-39]

**Building a high-performance distributed video server by using autonomous storage nodes,** H. Jin, G. Tan, L. Pang, Huazhong Univ. of Science and Technology (China) . . . . . [5022-40]

**Optimal admission control scheme for interactive video-on-demand servers,** H. Jin, H. Chen, Z. Han, Huazhong Univ. of Science and Technology (China) . . . . . [5022-41]

**MMSSS: a multi-multicast stream scheduling strategy for video server,** H. Jin, D. Deng, Z. Han, Huazhong Univ. of Science and Technology (China) . . . . . [5022-42]

**Motion-JPEG2000 video transmission over active network,** W. Yu, R. Qiu, J. E. Fritts, Washington Univ. . . . . [5022-43]

**Fine-grain scalable video coding using 3D wavelets and active meshes,** N. Cammas, France Telecom and IRISA (France); S. Pateux, IRISA (France) . . . . . [5022-44]

## ✔ Posters–Wednesday

*Posters will be placed on display after 9:00 am in the Exhibition Hall A. A poster session, with authors present at their posters, will be held Wednesday evening, 5:30 to 7:30 pm.*

#### Motion Analysis

✔ **Motion-based stereo representation of static scene,** L. Xin, Y. Wang, Institute of Automation (China) . . . . . [5022-83]

✔ **Motion estimation based on energy flow,** Z. Zhang, G. Liu, H. Li, Y. Li, Xi'an Jiaotong Univ. (China) . . . . . [5022-84]

✔ **Disparity space image based stereo matching using optimal path searching,** C. H. Kim, H. K. Lee, Y. H. Ha, Kyungpook National Univ. (Korea) . . . . . [5022-85]

✔ **Computing large-amplitude disparity fields,** M. Kardouchi, Univ. de Moncton (Canada); J. Konrad, Boston Univ. . . . . [5022-86]

#### MPEG4

✔ **Robust error control scheme for MPEG-4 video transmission,** X. Zhou, Y. Wang, Institute of Automation (China) . . . . . [5022-87]

✔ **Subtitle enhancement in MPEG-4 for very low bit rate streaming video,** T. K. Truong, S. H. Chen, I-Shou Univ. (Taiwan) . . . . . [5022-88]

✔ **Application-oriented facial analysis-synthesis system in MPEG-4,** C. Yang, L. Yu, W. Gong, Zhejiang Univ. (China) . . . . . [5022-89]

#### Image/Video Transmission

✔ **Content-based video streaming framework for universal multimedia access,** L. Zhao, J. Huang, S. Yang, Y. Zhong, Tsinghua Univ. (China) . . . . . [5022-90]

✔ **Load balance analysis for distributed video servers,** H. Jin, S. Wu, Huazhong Univ. of Science and Technology (China) . . . . . [5022-91]

✔ **Stereo sequence transmission via conventional transmission channel,** H. K. Lee, C. H. Kim, K. P. Han, Y. H. Ha, Kyungpook National Univ. (Korea) . . . . . [5022-92]

✔ **Delivering healthcare video communications to a disaster area within 2 hours using scale-free networks and edgesuite technology,** G. Hope, hopeandcare International Inc. . . . . [5022-93]

✔ **Transmission of JPEG2000 codestreams over packet erasure channels,** A. Bilgin, Z. Wu, M. W. Marcellin, Univ. of Arizona . . . . . [5022-94]

✔ **Trellis decoding for MPEG-4 streams over wireless channels,** Q. Chen, K. P. Subbalakshmi, Stevens Institute of Technology . . . . . [5022-95]

✔ **Feature-based adaptive error concealment for image transmission over wireless channel,** S. Ye, G. Wang, X. Lin, Tsinghua Univ. (China) . . . . . [5022-96]

#### Image/Video Content Analysis and Retrieval

✔ **Robust inlier detection in generating object's 3D model,** Y. Liu, Zhejiang Univ. (China) . . . . . [5022-99]

✔ **Integrated approach to video object segmentation and shape coding using B-splines,** J. Zaletelj, Univ. of Ljubljana (Slovenia) . . . . . [5022-100]

# Conference 5022

✔ **Fast human face detection using successive face detectors with incremental detection capability,** F. Zuo, Technische Univ. Eindhoven (Netherlands); P. H. N. de With, CMG Eindhoven BV (Netherlands) . . . . . [5022-101]

✔ **Test based on normal scores for efficient edge detection in image,** M. H. Choi, Daegu Polytechnic College (Korea); H. K. Lee, Y. H. Ha, Kyungpook National Univ. (Korea) . . . . . [5022-102]

✔ **Video-based diving movements composition and comparison,** Y. Li, Q. Liao, Tsinghua Univ. (China) . . . . . [5022-103]

✔ **MPEG-7 and TV-anytime based multi-agents platform for interactive broadcasting system,** S. H. Jin, Y. M. Ro, Information and Communications Univ. (Korea) . . . . . [5022-104]

✔ **COM-based scene segmentation in news video,** H. Liu, D. Zhou, Wuhan Univ. (China) . . . . . [5022-105]

✔ **New edge-based feature extraction algorithm for video segmentation,** E. Saez Peña, Univ. de Cordoba (Spain); J. M. Gonzalez Linares, Univ. de Malaga (Spain); J. M. Palomares Muñoz, J. I. Benavides Benitez, Univ. de Cordoba (Spain); N. Guil-Mata, Univ. de Malaga (Spain) . . . . . [5022-106]

✔ **Vision-mediated interaction with the Nottingham caves,** A. Ghali, S. Beyomi, J. Green, T. Pridmore, S. Benford, Univ. of Nottingham (UK) . . . . . [5022-107]

✔ **Inverted index for image retrieval using color pair feature terms,** M. Westmacott, P. H. Lewis, Univ. of Southampton (UK) . . . . . [5022-108]

✔ **Research friendly MPEG-7 software testbed,** F. C. Chang, H. M. Hang, H. C. Huang, National Chiao Tung Univ. (Taiwan) . . . . . [5022-109]

✔ **Hybrid algorithm for detecting abrupt transition effects based on edges and cromatic information,** M. J. Gallardo Otero, J. M. Palomares Muñoz, E. Saez Peña, Univ. de Cordoba (Spain) . . . . . [5022-110]

✔ **Vision-based UAV navigation using 3D GIS data,** J. Zhang, W. Liu, Univ. of Wisconsin/Milwaukee . . . . . [5022-111]

✔ **Vehicle feature extraction by patch-based sampling,** W. L. Lam, C. C. Pang, N. H. Yung, Univ. of Hong Kong . . . . . [5022-112]

**Video Coding**

✔ **Motion-compensated 3D video coding using smooth transitions,** K. Hanke, T. Rusert, J. R. Ohm, RWTH Aachen (Germany) . . . . . [5022-113]

✔ **Low-resolution optimized 3D-subband scalable codec,** A. Bourge, Philips Research France (France) . . . . . [5022-114]

✔ **Implementation of a real-time software-only image smoothing filter for a block-transform video codec,** W. F. Miaw, L. A. Rowe, Univ. of California/Berkeley . . . . . [5022-115]

✔ **Novel orthogonal logarithmic search algorithm for low bit rate video coding,** S. Soongsathitanon, S. S. Dlay, Univ. of Newcastle upon Tyne (UK) . . . . . [5022-116]

✔ **Novel 3D scalable video compression algorithm,** S. Somasundaram, K. P. Subbalakshmi, Stevens Institute of Technology . . . . . [5022-117]

✔ **Video compression based on fractal theory,** K. B. Abraham, Y. Yang, Univ. of Science and Technology of China . . . . . [5022-118]

✔ **Spatially scalable video coding with in-band prediction,** C. Mayer, S. Albert, RWTH Aachen (Germany) . . . . . [5022-119]

✔ **Adaptive prefilter for bit-rate improvement in video compression,** A. Uchida, K. Tanaka, Shinshu Univ. (Japan) . . . . . [5022-120]

✔ **Study of a lossless video coding algorithm based on H.26L tools,** S. Sun, S. Lei, Sharp Labs. of America . . . . . [5022-121]

**Image/Video Processing**

✔ **Image enhancement by frequency extrapolation using a multiscale edge representation,** F. Jin, P. W. Fieguth, L. L. Winger, E. Jernigan, Univ. of Waterloo (Canada) . . . . . [5022-122]

✔ **Video post-processing using 3D Huber-Markov random field model,** Z. Li, E. J. Delp III, Purdue Univ. . . . . [5022-123]

✔ **Adaptive image restoration with spatial statistics,** T. Pham, Defence Science and Technology Organisation (Australia) . . . . . [5022-124]

✔ **Image enhancement of polarized images using wavelet orthognality and biorthogonality,** K. J. Jones, Rice Univ. . . . . [5022-125]

**Image Coding, Analysis**

✔ **Hyperspectral image compression using three-dimensional wavelet coding,** X. Tang, W. A. Pearlman, Rensselaer Polytechnic Institute; J. W. Modestino, Univ. of Miami . . . . . [5022-127]

✔ **ROI coding with region-based integer wavelet transforms and unbalanced spatial orientation trees,** A. Cuhadar, Carleton Univ. (Canada) . . . . . [5022-128]

✔ **Region of interest coding in volumetric images with shape-adaptive wavelet transform,** I. Ueno, Mitsubishi Electric Corp. (Japan); W. A. Pearlman, Rensselaer Polytechnic Institute . . . . . [5022-129]

✔ **Rate-distortion optimized embedded zerotree coding,** Z. Liu, L. J. Karam, Arizona State Univ. . . . . [5022-130]

✔ **Hybrid DWT-SVD image-coding system (HDWTSVD),** H. Ochoa, K. R. Rao, Univ. of Texas/Arlington . . . . . [5022-132]

✔ **Lossy multimedia encryption,** H. Xiang, Shandong Univ. (China) . . . . . [5022-133]

✔ **Proxy-based handheld device handheld to live NASA satellite weather images,** C. W. Chen, Sarnoff Corp.; M. Wu, J. Cai, Univ. of Missouri/Columbia . . . . [5022-134]

✔ **Bluetooth digital still camera,** G. Santoro, M. Guarnera, A. Cucchi, M. Binachessi, STMicroelectronics (Italy) . . . . . [5022-135]

✔ **XML-based category-adaptive WWW information retrieval,** Y. F. Chen, X. Sun, C.-C. J. Kuo, Univ. of Southern California . . . . . [5022-136]

✔ **Fourier vision-based multilayer image segmentation,** L. Xin, Y. Wang, Institute of Automation (China) . . . . . [5022-137]

✔ **Evaluation of color spaces in the sense of rate and subjective quality,** S. Takamura, Y. Yashima, NTT Cyber Space Labs. (Japan) . . . . . [5022-138]

✔ **Moving objects extraction in diving video,** Y. Li, Q. Liao, Tsinghua Univ. (China) . . . . . [5022-139]

✔ **Fast hybrid interpolation,** C. Lee, S. Cho, Yonsei Univ. (Korea) . . . . . [5022-140]

✔ **Resolution enhancement of video sequences with simultaneous estimation of the regularization parameters,** L. P. Kondi, H. He, Univ. at Buffalo . . . . . [5022-142]

✔ **Data fusion-based adaptive image interpolation for low-resolution video,** J. Shin, Korea Institute of Science and Technology (Korea); J. Paik, Chung-Ang Univ. (Korea) . . . . . [5022-143]

✔ **New methods of instruction compression for VLIW processors,** X. Hong, Q. Yao, P. Liu, Zhejiang Univ. (China) . . . . . [5022-144]

Order Proceedings now and take advantage of the special prepublication price: $150

*Proceedings V*olume 5022.

*See p. 71 to order.*

## Thursday 23 January

**Plenary Speaker . . . . . Thurs. 8:30 to 9:15 am**

**Computer Vision and Computer Graphics: Direct and Inverse Problems**

**Tomaso A. Poggio,** Artificial Intelligence Lab., Massachusetts Institute of Technology

*See pg. 4 for details.*

## Sessions 8-9 and 10 run concurrently.

### SESSION 8 . . . . . Thurs. 9:30 to 10:30 am

**Video Segmentation**

**Efficient segmentation of spatio-temporal data from simulations,** C. Kamath, I. K. Fodor, Lawrence Livermore National Lab. . . . . [5022-45]

**Video segmentation and occlusion detection over multiple frames,** J. Konrad, M. Ristivojevic, Boston Univ. . . . . [5022-46]

**Spatio-temporal shadow segmentation and tracking,** E. Salvador, A. Cavallaro, T. Ebrahimi, Swiss Federal Institute of Technology (Switzerland) . . . . . [5022-47]

### SESSION 9 . . . . . Thurs.11:00 am to Noon

**Multimedia Content Retrieval**

**Hybrid signal-feature system for music discovery,** R. Samadani, A. Said, D. Mukherjee, Hewlett-Packard Labs. . . . . [5022-48]

**Texture-based image retrieval using multiscale sub-image matching,** M. F. Ahmad Fauzi, P. H. Lewis, Univ. of Southampton (UK) . . . . . [5022-49]

**Feature transformation in compressed domain for content-based image indexing and retrieval,** H. S. Wong, City Univ. of Hong Kong . . . . . [5022-50]

Lunch/Exhibition

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

**Video Coding**

**Optimal rate control for video coding based on a hybrid MMAX/MMSE criterion,** S. Y. Lee, A. Ortega, Univ. of Southern California . . . . . [5022-51]

**Sequence level rate control and quality smoothing for real-time video recording,** Z. He, C. C. Wen, Sarnoff Corp. . . . . [5022-52]

**Common channel adaptation approach for video coding,** J. M. Tavares, A. Navarro, Univ. de Aveiro (Portugal) . . . . . [5022-53]

**Message-passing algorithm for two-dimensional dependent bit allocation,** P. Sagetong, A. Ortega, Univ. of Southern California . . . . . [5022-54]

**Computationally efficient operational rate-distortion optimal SNR scalable video codec,** L. P. Kondi, Univ. at Buffalo . . . . . [5022-55]

**Modified fixed-length entropy coding for robust video compression,** G. Zhang, R. L. Stevenson, Univ. of Notre Dame . . . . . [5022-56]

**Rate-distortion models for video transcoding,** P. Yin, Princeton Univ.; A. Vetro, Mitsubishi Electric Research Labs.; B. Liu, Princeton Univ. . . . . [5022-57]

Lunch/Exhibition Break

## Sessions 11 and 13 run concurrently.

### SESSION 11 . . . . . Thurs. 1:30 to 3:10 pm

**Object Tracking**

**Semantic object tracking under occlusion by multiframe registration,** J. Gao, A. Kosaka, Purdue Univ. . . . . [5022-58]

**Voting-based simultaneous tracking of multiple video objects,** A. Amer, Univ. du Québec (Canada); E. Dubois, Univ. of Ottawa (Canada); A. Mitiche, Univ. du Québec (Canada) . . . . . [5022-59]

**Fusion strategies for context-based object detection in video sequences,** L. Paletta, C. Greindl, Joanneum Research (Austria); A. Goyal, Indian Institute of Technology (India) . . . . . [5022-60]

**Tracking object with shadows,** H. Jiang, M. S. Drew, Simon Fraser Univ. (Canada) . . . . . [5022-62]

### SESSION 13 . . . . . Thurs. 1:30 to 3:30 pm

**Video Scaling**

**Adaptive field/frame selection for high-compression coding,** X. M. Zhang, New Jersey Institute of Technology; A. Vetro, H. Sun, Mitsubishi Electric Research Labs.; Y. Q. Shi, New Jersey Institute of Technology . . . . . [5022-69]

**High-definition experience from standard definition video,** E. B. Bellers, Philips Research Labs. . . . . [5022-70]

**Deinterlacing using directional interpolation and motion compensation,** O. Kwon, C. Lee, Yonsei Univ. (Korea) . . . . . [5022-71]

**Content-adaptive video up-scaling for high-definition displays,** J. Leitao, M. Zhao, Technische Univ. Eindhoven (Netherlands); G. de Haan, Technische Univ. Eindhoven and Philips Research Labs. (Netherlands) . . . . . [5022-72]

**HD visual effect recreation from MPEG-2 MP@ML compressed video with embedded HD-relevant multilevel structure,** T. H. Lan, L. Boroczky, Philips Research Labs. . . . . [5022-73]

**Superresolution video reconstruction,** L. Hong, STMicroelectronics . . . . . [5022-74]

Order Proceedings now and take advantage of the special prepublication price: $150

*Proceedings V*olume 5022.

*See p. 71 to order.*

## Sessions 12 and 14 run concurrently.

### SESSION 12 ..... Thurs. 3:30 to 5:30 pm

#### Object Analysis

**Real-time system for high-level video representation: application to video surveillance,** A. Amer, Univ. de Québec (Canada); E. Dubois, Univ. of Ottawa (Canada); A. Mitiche, Univ. du Québec (Canada) ..... [5022-63]

**Recognition of user-defined video object models using weighted graph homomorphisms,** D. Farin, Univ. Mannheim (Germany); P. H. N. de With, CMG Eindhoven BV and Technische Univ. Eindhoven (Netherlands); W. Effelsberg, Univ. Mannheim (Germany) ..... [5022-64]

**Distributed processing method for arbitrary view generation in camera sensor network,** M. P. Tehrani, T. Fujii, M. Tanimoto, Nagoya Univ. (Japan) ..... [5022-65]

**Utilizing MPEG-7 in digital interactive broadcasting for movie previewing based on a digital broadcast item approach,** A. R. Lugmayr, R. Creutzburg, S. Kalli, A. Mailaparampil, Tampere Univ. of Technology (Finland) ..... [5022-66]

**Hybrid approach to classifying sky regions in natural images,** A. Singhal, J. Luo, Eastman Kodak Co. ..... [5022-67]

**Mutual information analysis of JPEG2000 contexts,** Z. Liu, L. J. Karam, Arizona State Univ. ..... [5022-68]

### SESSION 14 ..... Thurs. 3:50 to 5:30 pm

#### Image Coding

**Wavelet filter criteria for image compression,** F. Nicolier, G. Millon, Univ. de Reims Champagne-Ardennes (France); F. Truchetet, Univ. de Bourgogne (France) . [5022-75]

**Fractal image encoding based on adaptive search,** K. B. Abraham, Y. Yang, B. H. Fang, Univ. of Science and Technology of China ..... [5022-76]

**Rate-controlled region of interest based image coding with JPEG-LS,** E. A. Edirisinghe, S. Bedi, Loughborough Univ. (UK) ..... [5022-77]

**Efficient compression technique for panorama camera motion,** H. Farouk, Electronic Research Institute (Egypt) ..... [5022-78]

**Evaluation of image compression methods for aerial photos,** P. Fränti, V. Hautamäki, J. Heino, Univ. of Joensuu (Finland) ..... [5022-79]

## Friday 24 January

## Sessions 15-16 and 17 run concurrently.

### SESSION 15 ..... Fri. 9:00 to 10:00 am

#### Image/Video Processing

**Statistical video stabilization using Kalman filtering and mosaicing,** A. Litvin, J. Konrad, W. C. Karl, Boston Univ. ..... [5022-80]

**Wavelet-based image denoising using non-stationary stochastic geometrical image priors,** S. V. Voloshynovskiy, O. Koval, T. Pun, Univ. de Geneve (Switzerland)[5022-81]

**Simultaneous luminance and position stabilization for film and video,** A. C. Kokaram, R. Dahyot, F. Pitie, H. Denman, Univ. of Dublin Trinity College (Ireland) ..... [5022-82]

### SESSION 16 ..... Fri.10:30 am to 12:30 pm

#### Media Processors

**New C64x media processor** *(Invited Paper),* J. Golston, Texas Instruments Inc. ..... [5022-145]

**Mapping of H.264 decoding on a multiprocessor architecture,** E. B. van der Tol, E. G. T. Jaspers, R. H. Gelderblom, Philips Research Labs. (Netherlands) ..... [5022-146]

**Optimized video decoder architecture for TMS320C64x DSP generation,** S. Arora, R. Reddy, Texas Instruments India Ltd. (India) ..... [5022-147]

**Vector DSP for digital media processors,** J. Redford, B. Bersack, M. Moniz, M. Goldman, ChipWrights, Inc. ..... [5022-148]

**Design low-power lifting-based coprocessor for mobile multimedia applications,** P. P. Dang, P. M. Chau, Univ. of California/San Diego ..... [5022-149]

### SESSION 17 ..... Fri. 9:00 to Noon

#### Special Session: Technical Issues on JPEG Patents

*Chair:* **Touradj Ebrahimi,** Swiss Federal Institute of Technology (Switzerland)‹DATA10›

Technical Presentations and Panel Discussion.

Order Proceedings now and take advantage of the special prepublication price: $150

*Proceedings V*olume 5022.

*See p. 71 to order.*

Take a Short Course at

*IS&T/SPIE Symposium 2003 on*

# Electronic Imaging

## Science and Technology

**Students: Save 50% on Short Courses!***

**Electronic Imaging • Digital Image Sensors**
**Color Management • Image Processing • Holography**

- Choose from introductory courses to advanced technical subjects
- Interact with instructors and colleagues in a live, classroom setting
- Receive bound notes and view graphs that illustrate course material

Today's competitive job market requires that you stay current with changing technology. Get continuing education and focused training with live short courses.

**Course capacity is limited—**
**register now to ensure your participation!**

*Industry-leading companies send their staff to Short Courses at Electronic Imaging year after year. Attendees said this about their learning experience:*

> *"Mr. Lomheim was very knowledgeable about the subject and gave excellent examples of the real limitations of CCD & CMOS technology. The system level trades were very useful in determining the FPA level flow down requirements." (SC068)*

> *"Single best continuing education course I have taken. Huge amount of info covered well in a short time. Instructor very enthusiastic." (SC080)*

> *"Excellent voice & knowledge; very open to discussions that lead to topics not directly related to course outline." (SC464)*

**CEUs Offered for Short Courses**

The Continuing Education Unit®

The Education Services Department of SPIE—The International Society for Optical Engineering is an authorized provider of CEUs through IACET—The International Association of Continuing Education and Training, Registration Number 1001635. CEUs, (Continuing Education Units) are a nationally recognized unit of measure for continuing education and training programs that meet certain criteria.

SPIE awards CEUs to participants who successfully attend short courses, and complete and return the evaluation form with in 30 days of the course presentation. SPIE maintains a record of all CEUs earned for each participant for seven years.

*Students with proof of status receive 50% off IS&T/SPIE Short Courses. Offer applies to undergraduate/graduate students who are not also full-time employees in the industry, government, or academia.

Group discounts are available for companies and institutions. Contact Pam Forness at IS&T for further information:
Tel +1 703 642 9090, or
e-mail pam@imaging.org.

**Money-Back Guarantee**
IS&T/SPIE stand behind the quality of our courses and instructors. If for any reason you are dissatisfied, IS&T/SPIE will refund your course fee and consider your suggestions to improve the course.

# EI 2003 Short Course Index

## Capture and Display

*Monday*
**SC060** Stereoscopic Display Application Issues (Woods, Merritt) . . . p.51
**SC516** Color Consideration for Liquid Crystal Displays (Marcu) . . . . p.53
**SC518** Liquid Crystals for Displays and Telecommunications (Wu) . . p.53
**SC519** Digital Photography Fundamentals (Sampat) . . . . . p.54
**SC520** Liquid Crystal Materials and Devices: Tutorial and Laboratory (Crawford) . . . . . p.54
**SC522** Holographic Recording Materials (Bjelkhagen) . . . . . p.55
**SC523** Embossed Holography (Cvetkovich) . . . . . p.55

*Tuesday*
**SC068** Use of CCDs and CMOS Sensors in Visible Imaging Applications (Lomheim) . . . . . p.52
**SC504** Introduction to CCD and CMOS Imaging Sensors and Applications (Janesick) . . . . . p.52
**SC528** Color Imaging with Visible Image Sensors (Lomheim) . . . . . p.55

## Digital Systems and Engineering

*Monday*
**SC494** How to Select the Right Image Sensor for Your Application (Putnam) . . . . . p.58
**SC513** Practical MTF Metrology for Digital Cameras and Scanners (Burns, Williams) . . . . . p.58
**SC514** Introduction to Digital Halftoning (Allebach, Wong) . . . . . p.59
**SC515** Advanced Concepts in Digital Halftoning (Allebach, Wong) . . p.59

*Tuesday*
**SC075** Effective Color Computing (Marcu) . . . . . p.56
**SC464** Image Processing and Recognition Using Neural Networks, Wavelets, and Statistical Techniques (Javidi) . . . . . p.56
**SC526** Software Project Management (Laplante) . . . . . p.60

*Wednesday*
**SC466** Real-time Systems Design and Analysis (Laplante) . . . . . p.56
**SC467** Digital Imaging System Fundamentals—The Systems Perspective (Sampat) . . . . . p.57
**SC468** Advanced Digital Image Processing Techniques (Rabbani) . . p.57
**SC491** Neural Networks Applications in Imaging Processing (Nasrabadi) . . . . . p.57
**SC511** Applied Imaging Based Morphology (Bonifazi) . . . . . p.58
**SC512** Electronic Imaging Based Morphology (Bonifazi) . . . . . p.58
**SC524** Object-Oriented Analysis and Design Using the UML (Neill) . p.60
**SC527** Software Specification and Design for Image Processing (Laplante) . . . . . p.60

## Data, Internet and Multimedia

*Monday*
**SC080** Fundamentals of Wavelet Image Compression and the Emerging JPEG-2000 Standard (Rabbani) . . . . . p.61
**SC084** An Introduction to Cryptography and Digital Watermarking with Application to Imaging, Video, and Multimedia Systems (Delp, Podilchuk) . . . . . p.61

*Thursday*
**SC521** Analyzing and Visualizing Knowledge Domains (Borner) . . . p.61
**SC525** Introduction to Information Assurance: How Secure is Your Data? (Erbacher) . . . . . p.62

## General Interest

*Wednesday*
**SC517** An Introduction to Marketing for Scientists and Engineers (Gilblom) . . . . . p.62

# Capture and Display

## Stereoscopic Display Application Issues

When correctly implemented, stereoscopic 3D video displays can provide significant benefits in many areas, including endoscopy and other medical imaging, remote-control vehicles and telemanipulators, stereo 3D CAD, molecular modelling, 3D computer graphics, 3D visualization, and video-based training. This course conveys a concrete understanding of basic principles and pitfalls that should be considered in transitioning from 2D to 3D displays, and in testing for performance improvements. The course demonstrates a range of stereoscopic hardware and 3D imaging/display principles, emphasizing key issues in an ortho-stereoscopic video display setup, and showing video from a wide variety of applied stereoscopic imaging systems.

*LEARNING OUTCOMES*
This course will enable you to:
- list critical human factors guidelines for stereoscopic display configuration and implementation
- calculate optimal camera focal length, separation, display size, and viewing distance to achieve a desired level of depth acuity
- calculate comfort limits for focus/fixation mismatch and on-screen parallax values as a function of focal length, separation, convergence, display size, and viewing distance factors
- set up a large-screen stereo display system using AV equipment readily available at most conference sites, for slides and for full-motion video
- evaluate the trade-offs among currently available stereoscopic display technologies for your proposed applications
- list the often-overlooked side-benefits of stereoscopic displays that should be included in a cost/benefit analysis for proposed 3D applications
- avoid common pitfalls in designing tests to compare 2D vs. 3D displays
- calculate and demonstrate the distortions in perceived 3D space due to camera and display parameters
- design and set up an orthostereoscopic 3D imaging/display system
- explain the projective geometry involved in stereo modelling
- enumerate the problems, and the solutions, for converting stereoscopic video across video standards such as NTSC to PAL
- work with 3D Digital Video (DV) using a non-linear editing system and know how to create 3D DVDs
- describe the trade-offs among currently available stereoscopic display system technologies and determine which will best match a particular application.

*INTENDED AUDIENCE*
This course is designed for engineers, scientists, and program managers involved with video display systems for applications such as: medical imaging and endoscopic surgery, simulators and training systems, teleoperator systems (remote-control vehicles and manipulators), computer graphics, 3D CAD systems, data-space exploration and visualization, and virtual reality.

*INSTRUCTORS*
**Andrew Woods** is a research engineer at Curtin University's Centre for Marine Science and Technology, Perth, Western Australia, with over 10 years experience in the design, application and evaluation of stereoscopic video equipment in teleoperation applications, including devices for converting stereoscopic video from one standard to another.

**John Merritt** is a display systems consultant at the Interactive Technologies Division of The Merritt Group, Williamsburg, MA, with over 25 years experience in the design and humanfactors evaluation of stereoscopic video displays for telepresence & telerobotics, scientific visualization, medical imaging, and military applications.

Course level: Intermediate
SC060 CEU 0.65 $340 / $410 USD Monday 8:30 am to 5:00 pm

Students: Save 50% on Short Courses!

### Preregister by Short Course (SC) Number

**Preregister today to guarantee your participation.** *See p. 71 to register.*
1st price = IS&T/SPIE Member; 2nd price = Nonmember
CEU = Continuing Education Unit

# Electronic Imaging Short Courses

## Use of CCD and CMOS Sensors in Visible Imaging Applications

This course describes the imaging capabilities of visible sensors and illustrates their use with examples as varied as a commercial color scanning Telecine application and multispectral satellite imaging. The methodology for configuring and specifying a visible imaging system is described, including the role of charge-coupled device (CCD), and complementary metal-oxidesilicon (CMOS) focal plane technologies.

*LEARNING OUTCOMES*

This course will enable you to:

- explain the fundamentals of CCD imaging operation, charge packet formation, charge multiplexing and transport, and charge-to-voltage conversion
- describe and compare CCDs and other competing visible imaging device architectures [e.g. CMOS imagers and Charge Injection Devices (CID)]
- describe the processing functions of the video signal chain through analog-to-digital conversion
- describe signal propagation through a visible sensor and define the key imager/camera noise components
- define the key modulation transfer function (MTF) components of a visible imaging system
- analyze system imaging capability by the joint use of the system MTF and signal-to-noise ratio using an imaging simulation approach
- describe in detail an example of tailoring a CCD-based imaging system for motion-picture to High Definition Television (HDTV) signal conversion (Telecine)
- list important technical criteria for specifying the design, fabrication, and verification for state-ofthe-art visible imaging devices
- access a bibliography on CCDs, visible imaging devices, and other related subjects
- access to an appendix that describes a detailed example of tailoring of a visible sensor system for a multispectral pushbroom satellite imaging application
- access to an appendix that describes image formation, signal manipulation and processing, and noise effects for intensified (low-light level) imaging systems.

*INTENDED AUDIENCE*

Engineers, scientists, and managers who are interested in utilizing CCD, CMOS or CID sensors in advanced camera and imaging applications will benefit from this class.

*INSTRUCTOR*

**Terrence Lomheim** is a Distinguished Engineer at The Aerospace Corp. He has 24 years of hardware and analysis experience in visible and infrared electro-optical systems, focal plane technology, and applied optics, and has authored and co-authored 33 publications in these technical areas.

Course level: Introductory
SC068 CEU 0.35 $190 / $225 USD Tuesday 8:30 am to 12:30 pm

## Introduction to CCD and CMOS Imaging Sensors and Applications

Development and application status of CCD and CMOS imaging technologies are reviewed. General theory and operation for each technology are studied. Fundamental performance limits behind major sensor operations are discussed (i.e., charge generation, charge collection, charge transfer, and charge measurement). Performance differences between CMOS and CCD imaging arrays are covered. We will discuss operation principles behind popular commercial and scientific CMOS pixel architectures (e.g., photo diode, photo gate, pinned diode, charge share, etc.). Various array readout schemes are examined (e.g., frame transfer, interline transfer, full frame, progressive scan, rolling shutter, snap, etc.). We will also talk about backside illuminated arrays for UV, EUV and x-ray applications; high QE frontside illuminated sensors (phosphor coated, transparent gate, virtual phase, thin gate, etc.); deep depletion CCDs, ultra large CMOS and CCD arrays; high speed/ low noise parallel readout sensors. Describe the photon transfer technique in measuring performance and calibrating camera and chip systems (e.g., signal-to-noise, linearity, full well, read noise, dynamic range, QE sensitivity, ISO, responsivity, dark current, and fixed pattern noise). Charge transfer mechanisms are outlined. Carrier diffusion, pixel cross-talk, MTF and color performance are reviewed. We will review correlated double sampling theory used to achieve low noise performance. Various on-chip and off-chip noise sources are discussed (reset, white, flicker, RTS, dark current, cosmic rays, spurious charge, luminescence, image lag, amplifier, quantizing, electrical interference, etc.). There will be a brief review of radiation and ESD damage. Image defects, shorts, device yield, popular chip foundries, chip cost; custom designed and off-the-shelf sensors are discussed. We will conclude with a look at future research and development trends for each technology.

*LEARNING OUTCOMES*

This course will enable you to:

- describe operating CMOS and CCD arrays and camera systems for commercial and scientific imaging applications
- explain how CCD and CMOS arrays are designed, fabricated, tested and calibrated
- gain knowledge in applying test methodologies and performance standards
- list specifications and requirements to select a sensor for your imaging application
- understand performance differences between CMOS and CCD technologies
- understand how video signals are processed for optimum signal-to-noise performance
- become familiar with current and future imaging technologies and applications.

*INTENDED AUDIENCE*

This course is for scientists, engineers, and managers involved with high performance CCD and CMOS imaging sensors and camera systems.

*INSTRUCTOR*

**James Janesick** is the director of the CMOS/CCD advanced development group for Sarnoff Corporation. Previously he was at Conexant Systems Inc. developing CMOS imaging arrays for commercial applications. He was also technology director of Pixel Vision Inc. for five years developing high speed backside illuminated CCDs for scientific and cinema cameras. Prior to this Mr. Janesick was with the Jet Propulsion Laboratory for 22 years where as group leader he designed scientific CCDs and support electronics utilized in various NASA space-borne and astronomical ground based imaging systems. He received NASA medals for Exceptional Engineering Achievement in 1982 and 1992.

Course price includes the textbook, Scientific Charge Coupled Devices, (SPIE, 2001) by James Janesick.

Course level: Intermediate
SC504 CEU 0.65 $410 / $480 USD Tuesday 8:30 am to 5:30 pm

**Students: Save 50% on Short Courses!**

## Color Considerations for Liquid Crystal Displays

This course discusses and illustrates the most important factors of color rendering in Thin-Film Transistor Liquid Crystal Displays (TFT-LCD). Several TFT-LCD technologies such as Twisted Nematic (TN), In-Plane Switching (IPS) and Super IPS are discussed. The importance of color management (including calibration and ICC characterization) for accurate color control is explained and the analytical versus empirical color models are compared. The influence of viewing conditions and adaptation in the evaluation of the displayed color is highlighted. The role of measurement and interpretation of data (including gamut visualization and comparison) is demonstrated.

*LEARNING OUTCOMES*

This course will enable you to:

- describe the difference between TN, IPS and Super IPS display technologies
- compare the color performance of TN, IPS and Super IPS display technologies and understand the limitations in compensating for color differences between them
- explain the influence of luminance level on brightness and the perceived color gamut
- evaluate the role of gamma correction and its precise control of the color on the screen
- describe the chromaticity variation of the TN primaries with the input level and how to compensate for it in the color model
- define viewing flare and explain how to compensate for it in the color model
- define gray tracking and understand how to control it using the existing videocard lookup tables
- explain how to control the white point of the display and how to simulate a different target
- judge the suitability of analytical and empirical color models for different TFT-LCD technologies
- explain the calibration and the characterization processes for a TFT-LCD panel.

*INTENDED AUDIENCE*

This course is intended for engineers, scientists and managers confronting color issues in TFT-LCDs.

*INSTRUCTOR*

**Gabriel Marcu** is Senior Scientist in ColorSync group, at Apple Computer. His achievements are in color reproduction on displays and desktop printing (characterization/calibration, halftoning, gamut mapping, ICC profiling). Dr. Marcu is responsible for color calibration and characterization of Apple display products. He has taught seminars and short courses on color topics for Shizuoka University, Japan UC at Berkeley, EMI Cambridge, UK, and various IS&T, SPIE and SID conferences.

Course level: Introductory
SC516 CEU 0.35 $190 / $225 USD Monday 1:30 pm to 5:30 pm

## Liquid Crystals for Displays and Telecommunications

The class begins with an introduction to the basic molecular structure and physical properties of liquid crystals. It then describes the device physics, and various related applications. The following subjects related to liquid crystal displays are discussed: direct-view, projection and microdisplays in the context of multi-media projectors, mobile internet and personal entertainment displays; optimization of critical display attributes: wide angle viewing and fast response time for future LCD-TVs; description of the basic properties of liquid crystal materials and their incorporation into configurations for transmissive, reflective and transflective display applications; examination of the various operations modes enabling the reader to select the appropriate display type to meet a variety of needs.

*LEARNING OUTCOMES*

This course will enable you to:

- design liquid crystal molecules with desired physical properties
- optimize the display devices for achieving wide viewing angle and fast response time
- optimize the reflective and transflective display devices for mobile communications
- develop light switches for telecommunications.

*INTENDED AUDIENCE*

This tutorial is intended for scientists, engineers, and graduate students who are interested in flat panel displays, projection displays, mobile communications and telecommunications.

*INSTRUCTOR*

**Shin-Tson Wu** is a Provost Distinguished Professor of Optics at the School of Optics/CREOL, University of Central Florida. He is a recipient of the prestigious SID Special Recognition Award. Prof. Wu has published two books, "Reflective Liquid Crystal Displays" (Wiley-SID, 2001; with Prof. D. K. Yang) and "Optics and Nonlinear Optics of Liquid Crystals" (World Scientific, 1993; with Prof. I. C. Khoo).

Course level: Intermediate
SC518 CEU 0.35 $190 / $225 USD Monday 8:30 am to 12:30 pm

### Preregister by Short Course (SC) Number

**Preregister today to guarantee your participation.** *See p. 71 to register.*
1st price = IS&T/SPIE Member; 2nd price = Nonmember
CEU = Continuing Education Unit

# Electronic Imaging Short Courses

## Digital Photography Fundamentals

This course addresses the underlying principles behind digital photography. It is intended for a technical audience - those interested in the "how things work" of digital photography and how the cameras, printers and computers can be optimized to work together to produce high quality images. Topics covered include CCDs, CMOS, image resolutions, standards, image quality, implementation tradeoffs etc. A broad overview of the field is presented while emphasizing key issues and topics that are essential in understanding this rapidly changing field. The business side of the photographic industry is presented where appropriate. In-class demonstrations are used to clarify theory as necessary. This course will benefit anyone who works in this field, especially those who have little or no exposure to the technical side of photography.

*LEARNING OUTCOMES*

This course will enable you to:

- explain digital photography from a technical perspective
- make informed decisions about purchases using the technical specification sheets of cameras and printers
- explain the fundamental concepts used by imaging scientists and technologists
- describe Image Resolutions- Spatial, Brightness, Temporal, Spectral
- compare and contrast electronic image capture devices - Cameras/Scanners etc.
- explain Image file formats - JPEG, GIF, TIFF, ExiF and their uses in photography
- "manipulate" an image digitally (actual image processing examples using principles learned will be demonstrated)
- compare and evaluate printer technologies such as ink-jet, laser and dye-sublimation.

*INTENDED AUDIENCE*

Engineers, scientists, technicians, imaging technologists, technical sales and marketing personnel and anyone working in or planning to work in the imaging industry who wants to get an overview of digital photography - from input to output will benefit from this course. Technologists or engineers who work with different types of digital imaging equipment will find it particularly useful. System integrators as well as those who are concerned with image quality of various components and how it affects overall system performance will benefit greatly from this program.

*INSTRUCTOR*

**Nitin Sampat** is professor of Imaging at the Imaging and Photographic Technology Department of the Rochester Institute of Technology (RIT) where he teaches courses in Electronic Imaging Systems, Color Management, Electronic Sensitometry, and Digital Image Processing. He has over 15 years of experience designing and characterizing imaging systems. Prior to RIT, he worked at the Laboratory for Laser Energetics, where he designed imaging systems for nuclear fusion applications.

Course level: Introductory
SC519 CEU 0.35 $190 / $225 USD Monday 8:30 am to 12:30 pm

## Liquid Crystal Materials and Devices: Tutorial and Laboratory

This course emphasizes the fundamentals of liquid crystal materials (anisotropy, surfaces, etc.) and transition through their basic operating principles in several applications (displays, telecommunications, etc.) emphasizing their versatility, commonalties, and application focus. The goal is to provide the participants with a universal understanding and 'big-picture' perspective of this evolving technology. The course culminates with a hands-on laboratory where participants fabricate their own liquid crystal sample.

*LEARNING OUTCOMES*

This course will enable you to:

- display basic knowledge of liquid crystal materials and devices
- identify and explain the various liquid crystal material properties (shape, optical, and dielectric anisotropy, elastic constants, viscosity, surface interaction energies).
- explain the intimate connection between liquid crystal materials properties and application
- estimate, using order of magnitude calculations, basic electro-optic performance parameters such as threshold voltage and dynamic switching time
- analyze and evaluate a given application area and choose the appropriate liquid crystal technology to satisfy the application need
- build a liquid crystal cell and test its switching performance.

*INTENDED AUDIENCE*

The course is intended for graduate students and professional scientists and engineers who are interested in obtaining a basic working knowledge of liquid crystal optical devices. The course is a broad overview so it will have value to those just entering the field and those who wish to broaden their knowledge within the field. In addition, the course is suitable for individuals involved in technical marketing and sales, patent law and intellectual property, and technology management, who wish a broad introduction to the field.

*INSTRUCTOR*

**Gregory Crawford** is currently an Associate Professor of Engineering at Brown University where his basic research interests include liquid crystals, polymers, and their application in electro-optic devices. Prior to Brown University he was a member of the research staff at Xerox Palo Alto Research Center. He holds 18 U.S. and Foreign patents, and is the coeditor of the book entitled Liquid Crystals in Complex Geometries Formed by Polymer and Porous Networks.

Course level: Introductory
SC520 CEU 0.65 $340 / $410 USD Monday 8:30 am to 5:30 pm

## Holographic Recording Materials

An introduction to the holographic recording process is given, including also the demands on recording materials for holography. The course covers different recording materials for holograms, HOEs, and DOEs, which currently are on the market. In particular, the new improved silver halide (AgHal) emulsions from new sources as well as dichromated gelatin, photopolymer, photoresist, thermoplastic materials, and bacteriorhodopsin are all described.

*LEARNING OUTCOMES*
This course will enable you to:
- describe the holographic recording process and the materials' influence on the quality of holograms, HOEs, and DOEs
- recognize and describe the new ultra-fine-grain AgHal materials and other materials on the market
- discuss new processing methods, in particular, the silver halide sensitized gelatin, SHSG technique, to record high diffraction efficiency HOEs and DOEs on AgHal materials
- compare the performance of new materials with the old obsolete ones
- list and compare different materials and their processing techniques for various applications
- identify and apply new real-time recording materials in holographic applications.

*INTENDED AUDIENCE*
Researchers and holographers producing various types of holograms, HOEs, and DOEs, interested in traditional as well as new materials and their processing techniques will benefit from this course. Students interested in the holographic recording process and the recording materials' important influence on the quality of recorded optical elements and holograms will also be interested in this course. Production engineers in commercial holographic companies specialized in HOEs, display holograms, and optical variable devices, OVDs, for document security applications will also appreciate this class.

*INSTRUCTOR*
**Hans Bjelkhagen** is an expert on holographic materials and their processing methods. He has been working at places, such as, CERN, Switzerland, Fermilab, IL, and Northwestern University, IL. Since 1992 he has been developing color holography and color HOEs. In 1997 he joined De Montfort University, Leicester, UK. He is the author of Silver Halide Recording Materials for Holography, Springer-Verlag and the editor of Selected papers on Holographic Recording Materials, in the SPIE Milestone Series.

Course level: Intermediate
SC522 CEU 0.35 $190 / $225 USD Monday 8:30 am to 12:30 pm

## Embossed Holography

This course reviews the basic materials, and processes involved in making embossed holograms from the initial concept through to the final embossed film with emphasis on the optical production of the hologram itself. The course includes analysis of vibration isolation concerns, choice of optical mounts, and a review of the basic geometry used for most forms of embossed holography.

*LEARNING OUTCOMES*
This course will enable you to:
- explain how an embossed hologram works
- choose materials and coating techniques to produce holograms for subsequent embossing
- describe the various kinds of holograms suitable for embossing and know how to produce them. (three dimensional, two dimensional, dot matrix)
- examine some of the issues involved in electroplating holograms or casting off of holograms to prepare them for embossing
- review the various kinds of holographic embossing techniques
- summarize the options available in converting holograms for the end use.

*INTENDED AUDIENCE*
This course is suitable for technicians interested in creating a holographic laboratory and will act as an introduction to the subsequent steps for mass production, i.e., embossing, electroplating. It will be most appropriate for those interested in producing embossed holography for commercial uses such as packaging and authentication applications, but will still be useful for more scientifically oriented applications such as Holographic Optical Elements.

*INSTRUCTOR*
**Thomas Cvetkovich** has been working in commercial holography since the late seventies. He established one the first commercial holography mastering firms, Chromagem Inc. and has produced holograms for numerous international companies including General Mills, Pepsi and the U.S. Post Office. He taught summer Holography Workshops at Lake Forest College, Illinois for several years.

Course level: Intermediate
SC523 CEU 0.35 $190 / $225 USD Monday 1:30 pm to 5:30 pm

## Color Imaging with Visible Image Sensors

This course describes the principles, key technologies, and applications of color imaging using visible image sensors (CCD, CMOS). It briefly overviews the theory of human color perception; discusses the relevant television-based standards which apply to broadcast color video signals; discuss the evolution of color CCD and CMOS camera architectures and associated analog and digital signal processing techniques including those used to process color-filter array video signals; overview imager technology basics for digital still camera applications, and review the MPEG compression standard for High Definition Television.

*LEARNING OUTCOMES*
This course will enable you to:
- explain the basics of human color perception and how this is quantified for color video broadcast applications using the CIE color standards
- describe the National Television System Committee (NTSC) color signal encoding scheme (e.g. the interleaving of luminance and chrominance signals, setting of the chrominance sub-carrier frequency and signal bandwidths, formation of the three "transmission" primaries based on luminance and color-difference signals etc.)
- overview the PAL and SECAM color transmission standards; understand the architecture, operation, and signal processing of three and two sensor chip color cameras, including gamma correction, color correction, color-difference matrix operations, temporal/spatial filtering, and NTSC encoding
- explain the architecture and operation of single CCD or CMOS chip color cameras including: color filter arrays (CFA) formats using primary (red, green, blue) and complementary (cyan, magenta, yellow) filter elements, CFA signal demultiplexing, and other operations unique to CFA-based cameras
- access a fairly detailed appendix on the history, standards development, and technical methods (e.g. MPEG-2 compression) associated with high-definition television (HDTV)
- describe the sensor and optical formats and technology drivers for digital still camera applications
- access a bibliography on a wide variety of color imaging topics.

*INTENDED AUDIENCE*
Engineers, scientists and managers who are interested in color imaging and non-broadcast multicolor imaging applications will benefit from this class.

*INSTRUCTOR*
**Terrence Lomheim** is a Distinguished Engineer at The Aerospace Corp. He has 24 years of hardware and analysis experience in visible and infrared electro-optical systems, focal plane technology, and applied optics, and has authored and co-authored 33 publications in these technical areas.

Course level: Intermediate
SC528 CEU 0.35 $190 / $225 USD Tuesday 1:30 pm to 5:30 pm

### Preregister by Short Course (SC) Number

**Preregister today to guarantee your participation.** *See p. 71 to register.*
1st price = IS&T/SPIE Member; 2nd price = Nonmember
CEU = Continuing Education Unit

# Electronic Imaging Short Courses

## Digital Systems and Engineering

### Effective Color Computing

This course gives an overview of the color concepts used in the computer world today, with practical examples and demonstrations. This course translates theoretical color concepts into practical knowledge useful to the application developer. It is structured in three parts: color perception (trichromatic color vision, metamerism, color generation); color analysis (clustering and segmentation); and color reproduction (device dependent color, halftoning, gamut mapping, ICC profile, CMM). Computer animation is used for illustration of color spaces, 3D histograms, devices gamut, gamut mapping. Halftoning examples are presented for several screening methods (stochastic screening, several error diffusion variants, pulse density modulation and mixed techniques). Color management system architecture is discussed and the ICC profile specifications for accurate color reproduction are explained.

*LEARNING OUTCOMES*
This course will enable you to:
- describe the differences between the color as it is perceived by humans and processed by computer
- explain intuitive representation of color spaces (CIEXYZ, RGB, CMYK, HSV, HSL, CIELAB, CIELUV) and chromaticity diagrams ( CIE 1931 and 1976) and understand their utility in color computing
- identify the performances and limits of several clustering algorithms for color analysis
- describe gamut differences, and compare several gamut mapping techniques
- classify halftoning techniques, and summarize their advantages and limitations
- explain how a color management system operates based on ICC profiles.

*INTENDED AUDIENCE*
Engineers, scientists and managers involved in designing color applications or functions to effectively solve color problems in computer applications will benefit from this course. Participants should have some familiarity with color imaging and computer systems.

*INSTRUCTOR*
**Gabriel Marcu** is Senior Scientist in ColorSync group, at Apple Computer. His achievements are in color reproduction on displays and desktop printing (characterization/calibration, halftoning, gamut mapping, ICC profiling). Dr. Marcu is responsible for color calibration and characterization of Apple display products. He has taught seminars and short courses on color topics for Shizuoka University, Japan UC at Berkeley, EMI Cambridge, UK, and various IS&T, SPIE and SID conferences.

Course level: Advanced
SC075 CEU 0.35 $190 / $225 USD Tuesday 8:30 am to 12:30 pm

### Image Processing and Recognition Using Neural Networks, Wavelets, and Statistical Techniques

This course is aimed at people interested in learning practical applications of image processing techniques applied to real-time applications including biomedical image processing and image recognition problems. This course reviews fundamentals of digital image processing, imaging systems, image recognition, statistical filtering for image processing, fundamentals of wavelet transforms for image processing, fundamentals of neural networks for image processing, and recent advances in image recognition techniques. The course presents examples of applications using these techniques in real-time pattern recognition, target tracking, classification, and real-time biometrics recognition.

*LEARNING OUTCOMES*
This course will enable you to:
- explain the fundamentals of: image processing; wavelet transforms for image processing; neural networks for image processing; image recognition, object tracking, and data classification; and statistical filtering for image processing and recognition
- discuss applications to biomedical image processing
- articulate the recent advances in image processing and recognition
- recognize applications to biometrics recognition
- evaluate whether image processing and recognition systems are a good candidate for your information systems
- choose what types of image processing and recognition systems are suitable for the applications described
- describe metrics for evaluation image processing and recognition systems.

*INTENDED AUDIENCE*
This course is intended for engineers, physicists, biomedical engineers, computer scientists, physicians, and managers who are interested in learning about fundamentals of digital image processing, biomedical image processing applications, neural networks for image processing, wavelet transforms, statistical filters for image processing, image recognition, real-time pattern recognition systems, and applications.

*INSTRUCTOR*
**Bahram Javidi** Distinguished Professor of Engineering at the University of Connecticut is a Fellow of IEEE, OSA, and SPIE, and was appointed an NSF Presidential Young Investigator. He has published over 250 technical articles including over 50 invited papers.

Course price includes the textbook, *Smart Imaging Systems,* (SPIE, 2001) by Bahram Javidi.

Course level: Intermediate
SC464 CEU 0.65 $395 / $465 USD Tuesday 8:30 am to 5:30 pm

### Real Time Systems Design and Analysis

Real-time and embedded systems, which are closely related, are so ubiquitous that they are impossible to avoid. The term real-time has even entered non-technical jargon. But real-time systems are special and require special considerations to design. Based on the second edition of the best selling text, Real-Time Systems Design and Analysis: An Engineer's Handbook, this course provides an introduction to real-time systems and the real-time problem.

*LEARNING OUTCOMES*
This course will enable you to:
- identify the unique characteristics of real-time systems
- explain the general structure of a real-time system
- define the unique design problems and challenges of real-time systems
- apply real-time systems design techniques to various software programs.

*INTENDED AUDIENCE*
This course is ideal for newer software engineers or experienced software engineers who have never worked in real-time or embedded software environments. Managers of projects involving real-time systems will also benefit.

*INSTRUCTOR*
**Phillip Laplante** is Associate Professor of Software Engineering at Penn State's Great Valley Graduate Center. He has been involved in the development and design of real-time systems and imaging systems for almost 20 years. Dr. Laplante has published 13 books and numerous papers on the topics including Real-Time Systems, Real-Time Imaging and Software Engineering.

Course price includes the textbook, *Real-Time Systems Design and Analysis: An Engineer's Handbook* (Wiley/IEEE Press, 1996) by Phillip A. Laplante.

Course level: Introductory
SC466 CEU 0.35 $265 / $300 USD Wednesday 8:30 am to 12:30 pm

## Digital Imaging System Fundamentals

This comprehensive course offers the attendee an overview of the various components of an electronic imaging system (from scene to output) and how they affect overall image quality. Fundamental concepts in imaging science such as image resolutions, popular color spaces, color management, image compression standards and image processing algorithms are presented. The mechanism of operation of image input devices (cameras and scanners) and image output technologies is also presented. While the focus of the course is technical content - specifically system image quality, a perspective on the business side is offered where feasible.

*LEARNING OUTCOMES*
This course will enable you to:
- describe the principal components making up an electronic imaging system
- explain fundamental terminology used in describing images and the principles of color technology
- list and compare the popular image file formats in use today
- compare and judge different aspects of digital cameras and printers
- explain fundamental image processing algorithms
- list and compare current digital image compression standards
- differentiate between image resolution metrics like DPI, PPI and LPI
- explain how imaging scientists quantify image quality.

*INTENDED AUDIENCE*
This program will benefit technologists, engineers, programmers and managers who work with imaging equipment, and system integrators and engineers interested in learning the "big picture" of an electronic imaging system and understanding how components affect overall system performance, particularly those trying to get a quick start into the imaging field.

*INSTRUCTOR*
**Nitin Sampat** is professor of Imaging at the Imaging and Photographic Technology Department of the Rochester Institute of Technology (RIT) where he teaches courses in Electronic Imaging Systems, Color Management, Electronic Sensitometry, and Digital Image Processing. He has over 15 years of experience designing and characterizing imaging systems. Prior to RIT, he worked at the Laboratory for Laser Energetics, where he designed imaging systems for nuclear fusion applications.

Course level: Introductory
SC467 CEU 0.65 $340 / $410 USD Wednesday 8:30 am to 5:30 pm

## Advanced Image Processing

This course discusses some of the advanced algorithms in the emerging field of digital image processing. In particular, it familiarizes the audience with the understanding, design, and implementation of advanced algorithms in the areas of image enhancement, image restoration or deblurring, and digital image watermarking. Some of the applications include medical imaging, digital cameras, digital photofinishing, professional photography, forensic imaging, and astronomical imaging. Numerous image examples complement the technical descriptions.

*LEARNING OUTCOMES*
This course will enable you to:
- describe the various advanced techniques used in image enhancement such as adaptive contrast enhancement techniques (e.g., adaptive histogram equalization, Pizer, Wallis, etc.), adaptive sharpening techniques (e.g., nonlinear unsharp masking), and noise removal (e.g., selective averaging, median filtering, etc.)
- name and explain the various techniques used in image deblurring (restoration) such as inverse filtering, Wiener filtering, CLS and MAP filtering, projection unto convex sets (POCS)
- explain the basic techniques for invisible digital image watermarking used for copyright protection, metadata tagging, security, authentication, etc.
- assess the performance and effectiveness of the various techniques by viewing many image examples.

*INTENDED AUDIENCE*
Scientists, engineers, and managers who need to understand and/or apply the techniques employed in digital image enhancement, deblurring, or invisible image watermarking in various products in a diverse set of applications such as medical imaging, professional and consumer imaging, forensic imaging, etc. will benefit from this class. Some prior knowledge of linear system theory (e.g., Fourier transforms) and digital filtering would be helpful.

*INSTRUCTOR*
**Majid Rabbani** is a Research Fellow and the manager for the image compression and digital video processing Technology Areas within Eastman Kodak Research Labs. He is also an adjunct Associate Professor at Rochester Institute of Technology (RIT). He is a Fellow of SPIE and of IEEE and a Kodak Distinguished Inventor.

Course level: Advanced
SC468 CEU 0.65 $340 / $410 USD Wednesday 8:30 am to 5:30 pm

## Neural Network Applications in Image Processing

This course provides a broad introduction to the basic concepts of artificial neural networks and its application in image processing. A large number of neural network architectures and their training algorithms are reviewed. Examples of neural network architectures covered in this course are single layer perceptrons, multilayer perceptrons, time-delay neural networks, Kohonen feature maps, learning vector quantization, radial basis function and Hopfield neural networks. Applications that are covered are object and pattern recognition, object inspection, classifiers, handwritten word and digit recognition, automatic target recognition, and image compression.

*LEARNING OUTCOMES*
This course will enable you to:
- understand the fundamental concepts of artificial neural networks techniques
- distinguish between the classical pattern recognition algorithms and the neural network techniques
- compare the relative merits of various neural networks, i.e., single layer Perceptrons, multilayer Perceptrons, time-delay neural networks, Kohonen feature maps, learning vector quantization, radial basis function
- explain supervised and unsupervised training algorithms
- describe the typical applications of neural networks to image processing problems
  identify the most appropriate neural network algorithm for a particular image processing application.

*INTENDED AUDIENCE*
This course is intended for managers, engineers, computer scientists and graduate students who are interested in disciplines, such as signal and image processing, and optics. Engineers and scientists interested in acquiring basic technical knowledge in the area of neural networks and its applications in vision will benefit from this course.

*INSTRUCTOR*
**Nasser Nasrabadi** is a senior research scientist (ST) at US Army Research Laboratory (ARL) and an adjunct professor in the Electrical and Computer Engineering Dept. at the Johns Hopkins Univ. He is actively engaged in research in image processing, neural networks, automatic target recognition, and video compression and its transmission over high speed networks.

Course level: Introductory
SC491 CEU 0.65 $340 / $410 USD Wednesday 8:30 am to 5:30 pm

### Preregister by Short Course (SC) Number

**Preregister today to guarantee your participation.** *See p. 71 to register.*
1st price = IS&T/SPIE Member; 2nd price = Nonmember
CEU = Continuing Education Unit

# Electronic Imaging Short Courses

## How to Select the Right Image Sensor for Your Application

This course describes the full range of area-imager architectures including full-frame CCD, interline CCD, and CMOS and discuss their performance characteristics and their implementation in various applications including: consumer imaging; industrial and security imaging; scientific and medical imaging; professional photography and entertainment imaging; Practical examples provide the attendees with the knowledge and skills required to meaningfully compare sensor options in specific applications.

*LEARNING OUTCOMES*
This course will enable you to:
- describe differences in architecture, performance, and functionality between full frame CCD, interline CCD, and CMOS image sensors
- compare image sensors with different architectures from various manufacturers in ways that are meaningful and application-specific
- convert between different quantities and units used by various manufacturers to specify imager performance
- relate radiometric and photometric imager specifications
- determine base ISO and noise-based ISO for digital imaging systems and identify the most useful measure of sensitivity for your application.

*INTENDED AUDIENCE*
This course is appropriate for engineers and managers involved in the evaluation and procurement of image sensors, as well as for marketing and business development professionals who would like to survey digital imaging applications and the competitive advantages of different types of image sensors in those applications.

*INSTRUCTOR*
**Gloria Putnam** is an applications engineer at Eastman Kodak Company, Image Sensor Solutions, where she assists product developers with the selection of image sensors and development of cameras for applications ranging from radiography to consumer photography.

Course level: Introductory
SC494 CEU 0.35 $190 / $225 USD Monday 1:30 pm to 5:30 pm

## Applied Imaging Based Morphology

This course provides the attendee with basic working knowledge to perform morphological and morphometrical based characterization of closed domains (objects, cells, biological tissues, particles, etc.). It gives the fundamentals of digital morphology and shows its great potential for use in many research and industrial sectors. Case studies are presented and evaluated. Attendees will become fluent in the selection and design of analytical tools and architectures used to perform a morphological and morphometrical characterization of electronic images content.

*LEARNING OUTCOMES*
This course will enable you to:
- use techniques and easy-to-implement algorithms to realize a full morphological and morphometrical characterization of the domains of interest in the image
- design your own strategies to develop and set-up "intelligent procedures" to detect and handle complex (in terms of morphological and morphometrical attributes) systems
- select the best available hardware and software architecture to perform the analysis
- evaluate and compare results obtained following various approaches (classical morphology, mathematical morphology, digital morphology, signal based morphology, etc.).

*INTENDED AUDIENCE*
This class will be of value to researchers and scientists who want to learn more about morphological and morphometrical analytical based procedures. It will be especially useful in the design of control tools, both at the laboratory and industrial scale, that need to characterize and analyze "domains" presenting complex morphology,

*INSTRUCTOR*
**Giuseppe Bonifazi** is Full Professor of Raw Material Beneficiation at the University of Rome "La Sapienza" and has been involved in applied imaging, mainly in the field of materials and particle systems processing characterization, for over 20 years.

Course level: Intermediate
SC511 CEU 0.35 $190 / $225 USD Wednesday 1:30 pm to 5:30 pm

## Electronic Imaging Based Morphology

This course presents several applications, developed, both at laboratory and industrial scale. Starting from examples, the procedures adopted and the results obtained will be discussed to show attendees the potential offered by Electronic Imaging (EI) in real problem solving. Different approaches, together with the solution adopted and the results achieved will be presented and critically evaluated for application to fields such as: raw material processing; aesthetic logic based on quality control inspection systems; closed domains characterization (particles, cells, tissues); environmental monitoring; waste materials recycling.

The course is based on case studies derived from real problems, and guides the attendee through practical procedures, strategies and algorithms, rather than using heavy mathematical procedures.

*LEARNING OUTCOMES*
This course will enable you to:
- compare different EI based approaches
- learn the logic to follow when an EI based procedure has to be set up
- become fluent with many aspects related to the practical implementation of EI
- describe new application fields of EI
- apply procedures currently utilized in some fields (i.e. remote sensing) in other fields (i.e. materials science, quality control), jumping the gap between different EI worlds, usually "not talking" each other define process path where EI has a preeminent role (recognition, identification, sorting, quality control, etc.)
- explain how EI based control procedures can be integrated inside existing and well established processing layouts.

*INTENDED AUDIENCE*
This class is designed for managers and engineers who want to understand the potentialities offered by EI in real problem solving at a laboratory or industrial scale. Those who are planning to introduce or thinking about introducing EI based procedures into an existing process but have reservations about the approach to such a technique will greatly benefit from this class.

*INSTRUCTOR*
**Giuseppe Bonifazi** is Full Professor of Raw Material Beneficiation at the University of Rome "La Sapienza" and has been involved in applied imaging, mainly in the field of materials and particle systems processing characterization, for over 20 years.

Course level: Intermediate
SC512 CEU 0.35 $190 / $225 USD Wednesday 8:30 am to 12:30 pm

## Practical MTF Metrology for Digital Cameras and Scanners

This is a theory-to-practice course on MTF metrology for digital imaging capture devices and systems using standardized slanted-edge measurement protocols of ISO 12233, ISO 16067-1, and ISO 16067-2. Though the theory behind MTF and its components are well established, practical metrology issues frequently limit measurement precision, accuracy, and utility. How these protocols are applied to several types of image acquisition systems and field conditions and the advantages of doing so are explained using results from actual measurements. Time permitting; the evaluation of participant's own image capture devices may be performed.

*LEARNING OUTCOMES*
This course will enable you to:
- explain the underlying principles that allow slanted-edge MTF evaluation
- determine how to unambiguously audit manufacturers/vendors resolution claims
- gain knowledge on how to manage chaotic or non-linear data
- interpret MTF morphology due to image processing, and directional or optical field variations
- identify methods and means of target availability, cost, characterization, and design
- use publicly available and certified MTF evaluation software tools.

*INTENDED AUDIENCE*
Although technical in content, this course is intended for a wide audience: image scientists, quality engineers and others charged with evaluating or modeling digital camera and scanner performance.

*INSTRUCTORS*
**Peter Burns** has been at Kodak for the past eighteen years, working in image evaluation, system modeling and image processing. He has taught several imaging courses at Kodak, technical conferences, and as an adjunct professor at the Center for Imaging Science, RIT.

**Don Williams** works in Imaging Research and Development at Kodak. His work at Kodak focuses on quantitative signal and noise performance metrics for digital capture imaging devices and imaging system simulations. He co-leads the TC42 standardization efforts for digital print scanner (ISO 16067-1) and digital film scanner (ISO 16067-2) resolution measurement.

Course level: Intermediate
SC513 CEU 0.65 $340 / $410 USD Monday 8:30 am to 5:30 pm

## Introduction to Digital Halftoning

This course provides an introduction to the fundamental concepts of digital halftoning with an overview of the most successful digital halftoning algorithms. We discuss basic aspects of printer modeling and color as they pertain to digital halftoning, compression, watermarking, and descreening of digital halftones.

*LEARNING OUTCOMES*
This course will enable you to:
- explain the role of the human visual system in perception of halftone images
- describe characteristics of the two dominant printing technologies
- describe basic imaging pipeline for printers
- identify the fundamental types of halftone textures
- list and compare the three primary categories of digital halftoning algorithms in terms of computational requirements, image quality, and suitability for different printing technologies
- explain the impact of non-ideal printer behavior in digital halftoning
- extend monochrome halftoning algorithms to CMY or CMYK color
- explain how digital halftones are compressed, and approaches for generating halftones that are more suitable for compression
- describe how halftones can be descreened, and how watermarks may be embedded within digital halftones.

*INTENDED AUDIENCE*
This course is intended for managers and systems developers who need to know the basics of digital halftoning and who want to understand the current state-of-the-art. It will also be valuable for those who want an in-depth understanding of digital halftoning, but who are just getting started in the field. The emphasis will be on a descriptive, rather than analytical treatment. No background in image processing will be assumed, although some familiarity with basic imaging concepts will be helpful.

*INSTRUCTORS*
**Ping Wah Wong** is a consultant specializing in digital halftoning, image watermarking, image processing, data compression and security technologies. Previously he was with Hewlett-Packard managing research teams in halftoning and image processing, as well as software teams in the imaging area. Later he founded IDzap LLC, specializing in Internet security and privacy. Dr. Wong has published extensively in the imaging area. He co-chairs the annual IS&T/SPIE Conference on Security and Watermarking of Multimedia Contents held at the Electronic Imaging Symposium. He is an Associate Editor for Journal of Electronic Imaging.

**Jan Allebach** is Professor of Electrical and Computer Engineering at Purdue University. He has over 25 years experience in digital halftoning, and has published and taught extensively on this subject. He received the IS&T Bouman Award for leadership in imaging education, and is the Editor of the IS&T/SPIE Journal of Electronic Imaging.

Course level: Introductory
SC514 CEU 0.35 $190 / $225 USD Monday 8:30 am to 12:30 pm

## Advanced Concepts in Digital Halftoning

This course provides an in-depth look at advanced concepts of digital halftoning. Monochrome and color models for the rendering device and human visual system are presented, and model-based, iterative approaches to digital halftoning and application to model-based monochrome and color halftoning are discussed.

*LEARNING OUTCOMES*
This course will enable you to:
- explain search-based approaches to image halftoning and halftoning algorithm development
- develop models for a specific rendering device and human viewer that can be used in a digital halftoning algorithm
- modify a basic error diffusion algorithm to yield better quality and robustness
- design both dispersed and clustered dot screens for binary and multilevel devices
- explain color halftoning using search-based methods
- describe the role of halftone compression in the imaging pipeline, and examine the range of approaches to halftone compression
- analyze descreening approaches, and explore watermark embedding in halftones.

*INTENDED AUDIENCE*
This course is intended for those who need to develop state-of-the-art algorithms for digital halftoning and related image processing tasks, such as compression, watermarking, and descreening. Participants are assumed to have a broad familiarity with digital halftoning equivalent to that provided by the companion course Introduction to Digital Halftoning, as well as an understanding of basic image processing concepts, such as convolution and Fourier analysis. The emphasis will be on implementing algorithms for halftoning, and related image processing tasks, as well as analyzing the behavior of these algorithms.

*INSTRUCTORS*
**Ping Wah Wong** is a consultant specializing in digital halftoning, image watermarking, image processing, data compression and security technologies. Previously he was with Hewlett-Packard managing research teams in halftoning and image processing, as well as software teams in the imaging area. Later he founded IDzap LLC, specializing in Internet security and privacy. Dr. Wong has published extensively in the imaging area. He co-chairs the annual IS&T/SPIE Conference on Security and Watermarking of Multimedia Contents held at the Electronic Imaging Symposium. He is an Associate Editor for Journal of Electronic Imaging.

**Jan Allebach** is Professor of Electrical and Computer Engineering at Purdue University. He has over 25 years experience in digital halftoning, and has published and taught extensively on this subject. He received the IS&T Bouman Award for leadership in imaging education, and is the Editor of the IS&T/SPIE Journal of Electronic Imaging.

Course level: Advanced
SC515 CEU 0.35 $190 / $225 USD Monday 1:30 pm to 5:30 pm

### Preregister by Short Course (SC) Number

**Preregister today to guarantee your participation.** *See p. 71 to register.*
1st price = IS&T/SPIE Member; 2nd price = Nonmember
CEU = Continuing Education Unit

# Electronic Imaging Short Courses

## Object-Oriented Analysis and Design Using the UML

This course introduces the principles of sound object-oriented design within the context of imaging systems. Attendees will learn the diagrams and modeling techniques of the Unified Modeling Language - the de facto standard modeling language for object-oriented systems - as well as how to apply these tools in the design of reusable, robust software systems.

*LEARNING OUTCOMES*
This course will enable you to:
- describe software systems in the object-oriented style
- explain models described in the Unified Modeling Language
- list the principles of good design
- apply these principles in the object-oriented paradigm.

*INTENDED AUDIENCE*
Any member of a software project team, team leaders, software managers and directors can benefit from this course. It will also help anyone participating in a software project, at any level, to apply object-oriented techniques in the analysis, design and development of software systems.

*INSTRUCTOR*
**Colin Neill** is Assistant Professor of Software Engineering and Professor in Charge of Software Engineering at Penn State's Great Valley Graduate Center. He has been involved in the design and development of object-oriented systems for almost ten years.

Course level: Intermediate
SC524 CEU 0.35 $190 / $225 USD Wednesday 1:30 pm to 5:30 pm

## Software Project Management

This course provides attendees with a formal introduction to software project management principles and practices. Attendees will learn the similarities and differences between general and software project management, how to use metrics and tools to measure, track and improve performance and how to deal with various crisis situations. This course is especially valuable to new project managers or those without any formal project management training.

*LEARNING OUTCOMES*
This course will enable you to:
- identify the differences between software project management and management of non-software projects
- apply the basic principles of effective project management to software projects
- use software life cycle models to structure software projects
- estimate software efforts and costs
- deal with crisis situations such as changing requirements and lost personnel.

*INTENDED AUDIENCE*
Any member of a software project team, team leaders, software managers and directors will benefit from this course. This course will help anyone participating in a software project, at any level, to be more effective, particularly those who are managing a software team without formal training.

*INSTRUCTOR*
**Phillip Laplante** is Associate Professor of Software Engineering at Penn State's Great Valley Graduate Center. He has been involved in the development and design of real-time systems and imaging systems for almost 20 years. Dr. Laplante has published 13 books and numerous papers on the topics including Real-Time Systems, Real-Time Imaging and Software Engineering.

Course level: Introductory
SC526 CEU 0.35 $190 / $225 USD Tuesday 8:30 am to 12:30 pm

## Software Specification and Design for Image Processing

This course provides attendees with an overview of modern software specification and design techniques with an emphasis on their applicability and utility for image processing applications. Course attendees will learn the advantages and disadvantages of each technique in the context of image processing. Approaches studied include Structured Analysis/Structured Design and Object-Oriented Analysis and Design.

*LEARNING OUTCOMES*
This course will enable you to:
- distinguish between the most widely used software design and modeling approaches
- select the optimum approach for a particular imaging application
- write better software specifications and build better designs
- explain the role of standards and the software life cycle model in controlling software products

*INTENDED AUDIENCE*
Any member of a software project team, team leaders, software managers and directors will benefit from this course. This course will help anyone participating in a software project, at any level, to be more effective in writing requirements, translating requirements into designs, and coding image processing software.

*INSTRUCTOR*
**Phillip Laplante** is Associate Professor of Software Engineering at Penn State's Great Valley Graduate Center. He has been involved in the development and design of real-time systems and imaging systems for almost 20 years. Dr. Laplante has published 13 books and numerous papers on the topics including Real-Time Systems, Real-Time Imaging and Software Engineering.

Course level: Introductory
SC527 CEU 0.35 $190 / $225 USD Wednesday 1:30 pm to 5:30 pm

### Preregister by Short Course (SC) Number

**Preregister today to guarantee your participation.** *See p. 71 to register.*
1st price = IS&T/SPIE Member; 2nd price = Nonmember
CEU = Continuing Education Unit

## Data, Internet and Multimedia

### Fundamentals of Wavelet Image Compression and the Emerging JPEG-2000 Standard

The ISO JPEG committee is in the final stages of developing a new still-image compression standard, referred to as the JPEG-2000 that will be issued in 6 parts. JPEG-2000 is based on wavelet compression and provides the potential for numerous advantages over the existing JPEG standard. In this course, practical implementations of the wavelet transform, as applied to image compression (e.g., memory efficient implementations and the lifting scheme, various integer and floating point bi-orthogonal filters for lossless and lossy compression, etc.), and related quantization and coding strategies are discussed. The technical details of the JPEG-2000 Part 1 algorithm and syntax are reviewed extensively and the JPEG-2000 performance is compared to that of the existing DCT-based lossy JPEG standard. The superior features of the JPEG-2000 proposed standard are demonstrated by numerous image examples.

*LEARNING OUTCOMES*

This course will enable you to:

- explain the basic concepts of the discrete wavelet transform (DWT) operation such as the analysis and synthesis filter banks, bi-orthogonal filter banks, etc.
- describe practical and memory efficient implementations of the wavelet transform for image compression such as line-based transform, integer transforms, and the lifting scheme
- describe the various quantization and coding strategies used in conjunction with the wavelet decomposition such as embedded quantization and context-based arithmetic coding of bit-planes
- describe the latest technical developments in the JPEG-2000 algorithm and bitstream syntax and understand its various functionalities such as multi-resolution representation, lossy to lossless progression, SNR scalability, region of interest coding, and embedded bit stream architecture
- compare both the quantitative and the visual performance of the wavelet-based JPEG-2000 system to the existing DCT-based JPEG baseline.

*INTENDED AUDIENCE*

This class is intended for scientists and engineers as well as product planners who need to assess the impact of wavelet technology on the current and future products concerned with the efficient storage and transmission of images. No prerequisites are required.

*INSTRUCTOR*

**Majid Rabbani** is a Research Fellow and the manager for the image compression and digital video processing Technology Areas within Eastman Kodak Research Labs. He is also an adjunct Associate Professor at Rochester Institute of Technology (RIT). He is a Fellow of SPIE and of IEEE and a Kodak Distinguished Inventor.

Course level: Intermediate
SC080 CEU 0.65 $340 / $410 USD Monday 8:30 am to 5:30 pm

### Introduction to Cryptography and Digital Watermarking

This course presents an overview of recent work in modern encryption techniques. We also overview recent advances in image, video, and audio watermarking. The course describes block cipher systems (e.g. DES) and public key systems (e.g. RSA) along with authentication techniques. We discuss digital watermarking techniques including spatial, spectral, and temporal watermarking algorithms. Particular emphasis is placed on how encryption and watermarking are used in the context of the protection of imaging, video, and multimedia systems. The unique nature of these new technologies relative to intellectual property rights is presented.

*LEARNING OUTCOMES*

This course will enable you to:

- describe basic cryptography techniques and explain how these techniques could be useful in your own work
- determine when encryption techniques can be used for the protection and authentication of data
- explain the basics of digital watermarking and how these techniques can be used to protect intellectual property rights.

*INTENDED AUDIENCE*

The course is intended for engineers and scientists who work in the imaging and/or multimedia fields and who are interested in the area of data security. Students should have an undergraduate degree in science or engineering.

*INSTRUCTORS*

**Christine Podilchuk** is a Member of Technical Staff in the Research Division of Bell Laboratories in Murray Hill, NJ. Her research interests are in the general area of image processing. Her current areas of research include perceptually-based watermarking techniques for images and video.

**Edward Delp** is a Professor of Electrical and Computer Engineering at Purdue Univ. His research interests are in the areas of image and video processing and multimedia systems. Prof. Delp has developed and taught a graduate level cryptography course at Purdue for the past eight years.

Course level: Advanced
SC084 CEU 0.65 $340 / $410 USD Monday 8:30 am to 5:30 pm

### Analyzing and Visualizing Knowledge Domains

This course introduces advanced data mining and information visualization techniques that can be used to support science and technology management. It demonstrates how large amounts of data, e.g., publication, patent, and grant data, can be analyzed, correlated, and visualized to map the semantic space of researchers, publications, funding, etc.. The resulting visualizations can be utilized to objectively identify major research areas, experts, institutions, grants, publications, journals, etc. in a research area of interest. In addition, they can assist to identify interconnections, the import and export of research between fields, the dynamics (speed of growth, diversification) of scientific fields, scientific and social networks, and the impact of strategic and applied research funding programs, among others.

*LEARNING OUTCOMES*

This course will enable you to:

- identify R&D tasks that can be supported by analyzing and visualizing knowledge domains
- describe and use major data mining and visualization techniques
- select and combine appropriate techniques/systems for different application scenarios
- judge the potential and limitations of knowledge domain visualizations.

*INTENDED AUDIENCE*

This course will be of special interest to research and development managers in corporate, research, and governmental settings.

*INSTRUCTOR*

**Katy Boerner** is an Assistant Professor of Information Science at Indiana University. Her research focuses is on the development of tools that ease access to and management of the increasing amount of digitally available information. She teaches courses in Information Visualization, User Interface Design, and Human Computer Interaction.

Course level: Intermediate
SC521 CEU 0.35 $190 / $225 USD Thursday 8:30 am to 12:30 pm

## Introduction to Information Assurance: How Secure is Your Data?

Network connectivity has become ubiquitous and with it come concerns for the security and privacy of the associated computer and network infrastructure. Given the criticality of data communicated over networks and stored on networked systems, ensuring that the data is not compromised is vital. Understanding the fundamentals of computer security is necessary for an organization to protect such confidential data. This course will touch on various aspects of computer security, including: Host-Based Security, Network-Based Security, Encryption, Intrusion and Misuse Detection, Computer Forensics, and Legal Issues.

*LEARNING OUTCOMES*

This course will enable you to:

- list major issues within computer security
- identify implementable techniques for improving security
- list major forms of hacking attacks and their solutions
- identify areas of security concern within an organization
- construct an effective security policy.

*INTENDED AUDIENCE*

Individuals interested in improving their understanding of security issues and their ability to implement effective security strategies will benefit from this course. The course is designed for students, engineers, scientists and managers with a technical computer background and discrete mathematics.

*INSTRUCTOR*

**Robert Erbacher** received his ScD degrees in computer science from the University of Massachusetts-Lowell in 1993 and 1998, respectively. He joined the Department of Computer Science at The University at Albany-SUNY as an Assistant Professor in 1999 after spending a year at the University of Idaho as a visiting professor. He has taught over 20 courses since 1997, redesigned the curricula for several of the courses, and developed curricula for several new courses.

Course level: Introductory
SC525 CEU 0.35 $190 / $225 USD Thursday 1:30 pm to 5:30 pm

# General Interest

## An Introduction to Marketing for Scientists and Engineers

This course presents the basics of defining, publicizing, promoting and selling technical products and services. Techniques covered include product and service definition and pricing, development and placement of press releases and advertising, effective utilization of trade shows, efficient handling of inquiries and methods of assembling sales organizations. Emphasis is on the practical implementation of a few fundamental marketing techniques sufficient to give a new product or service a running start. Fundamentals of market planning and execution using practical examples relevant to marketing technical products and services are presented in the morning session. Following this, attendees will form into teams to carry out assignments involving observation and analysis of marketing practices in the technical exhibit. In the late afternoon we reconvene in a second shorter session, where the teams report on their findings and the results are discussed.

*LEARNING OUTCOMES*

This course will enable you to:

- appraise markets, competitors and environmental factors relating to the proposed product or service
- develop realistic marketing plans incorporating appropriate media, collateral and channels
- evaluate alternatives and formulate strategies for pricing, promotion, distribution and customer service
- select suppliers for advertising, public relations, trade shows, collateral, fulfillment and distribution
- track the effectiveness of marketing decisions.

*INTENDED AUDIENCE*

This course is intended for scientists and engineers with limited marketing experience that want to market their own products or skills or for those in larger companies that want to understand what their marketing departments are doing.

*INSTRUCTOR*

**Dave Gilblom** is founder and President of Pacific Photonics, Inc., a consulting firm that helps move new imaging products to market. He has spent over 30 years marketing imaging products for industrial, scientific and medical applications. He has authored dozens of technical papers and trade publication articles, given hundreds of formal presentations and trained many novice product managers in the fundamentals of marketing.

Course level: Introductory
SC517 CEU 0.35 $190 / $225 USD Wednesday 9:00 am to 12:00 pm and 5:00 pm to 6:00 pm

**Preregister by Short Course (SC) Number**

**Preregister today to guarantee your participation.** *See p. 71 to register.*

1st price = IS&T/SPIE Member; 2nd price = Nonmember
CEU = Continuing Education Unit

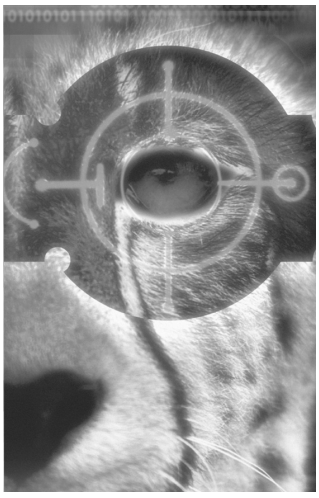
# Don't miss the Exhibition!

# Electronic Imaging

## Science and Technology

22–23 January 2003
Santa Clara Convention Center, Hall A
Santa Clara, California USA

Wednesday 22 January ..... 10:00 am to 4:00 pm; 5:30 pm to 7:30 pm
Thursday 23 January ..... 10:00 am to 4:00 pm



*Exhibitors as of September 2002:*

**Advanced Imaging Magazine**

**Apogee Instruments, Inc.**

**Cohu Inc.**

**Eastman Kodak Co. - Image Sensor Solutions**

**FillFactory**

**IMS CHIPS**

**Indigo Systems Corp.**

**IO Industries, Inc.**

**JCD Publishing**

**Leutrek Vision Inc.**

**Motic Instruments Inc.**

**NEOS Technologies, Inc.**

**Photonics Spectra - Laurin Publishing Co. Inc.**

**Schneider Optics, Inc.**

**StockerYale, Inc.**

**Vision Systems Design**

**Weinberger AG**

**Ziemer & Associates, Inc.**

## Exhibit now at Electronic Imaging!

This meeting and exhibition is your one-stop shop for meeting professionals involved in silver halide, digital printing, electronic imaging, photo finishing, image preservation, image assessment, pre-press technologies and hybrid imaging systems. Core member contingencies from IS&T (The Society for Imaging Science and Technology) and SPIE (The International Society for Optical Engineering) will also be well represented.

This highly focused audience will gather in Santa Clara to attend technical conferences, short courses and this FREE exhibition.

There is still space available at this new, stand-alone event for the imaging community — don't hesitate — contact SPIE Sales now!

Download an exhibitor contract and prospectus and get more information at: www.spie.org/exhibitions/ei or contact SPIE Sales at +1 360 676 3290 • Fax: +1 360 647 1445 • exhibitions@spie.org

The Santa Clara Convention Center is conveniently located in the Silicon Valley, provides plenty of hotel rooms, and offers ample free parking.

*Sponsored by*
IS&T The Society for Imaging Science and Technology
and
SPIE The International Society for Optical Engineering

# General Information

## Electronic Imaging 2003

Santa Clara Convention Center
5001 Great America Parkway, Santa Clara, California 95054
Westin Hotel
5101 Great America Parkway, Santa Clara, California 95054

## Registration Location and Information Hours

Short Course Registration Only

*Westin Hotel, Ballroom Foyer*

Monday, January 20, 2003 ..... 7:00 am to 4:00 pm

Symposium Registration

*Santa Clara Convention Center*

Monday and Tuesday ..... 7:00 am to 4:00 pm
Wednesday and Thursday ..... 7:30 am to 4:00 pm
Friday ..... 7:30 to 11:00 am

## Preregistration/Registration

SAVE MONEY! Register with payment by December 20 and save $100. Early registration with payment enables attendees quick pickup of registration materials. To preregister for the meeting, return the registration form with your payment to IS&T, 7003 Kilworth Lane, Springfield, Virginia 22151 by December 20. For those registering AFTER December 20, please ADD $100 to the total registration fee. Use the online form and save time!

*Full conference registration includes:*
Admittance to the conferences, poster sessions, exhibition, coffee breaks, dessert in the exhibition hall, the opportunity to purchase a discounted ticket (US$30) for the Electronic Imaging Banquet, and EI proceedings as applicable under the specific registration plans (see registration form on page 71 of this program). EI proceedings purchased as part of your registration plan include any applicable tax and shipping charges.

Short Course-only registration includes your selected short course(s), course notes, coffee breaks, and admittance to the exhibition.

## Speakers Audiovisual Desk Hours

Santa Clara Convention Center, Second Floor Foyer near the escalator

Monday - Friday ..... 7:30 am to 4:30 pm

Speakers who did not request audiovisual equipment or are using their own laptop are asked to stop at the Audiovisual Desk. Speakers who have requested to use a slide projector, VHS video player, or data projector may preview their materials at the Audiovisual Desk prior to their presentation. Speakers will be responsible for delivering visual materials to the conference room and may obtain materials from the room monitor in the conference room immediately following the session.

## Short Course Desk for Course Notes

*Westin Hotel, Ballroom Foyer*

Monday, January 20, 2003 ..... 7:00 am to 4:00 pm

*Santa Clara Convention Center*

Tuesday through Thursday ..... 7:30 am to 4:00 pm

Registrants for short courses must exchange each course ticket received with their registration materials for their course notes at the Short Course Desk as soon as possible after arrival at the meeting.

## Video/Digital Recording Policy

For copyright reasons, video or digital recording of any conference session, short course, or poster session is strictly prohibited without written prior consent from each specific presenter to be recorded. Individuals not complying with this policy will be asked to leave a given session and to surrender their film or disc. It is the responsibility of the presenter to notify the conference sponsors if such consent is given.

## Exhibition Hours

*Santa Clara Convention Center, Exhibition Hall*

Wednesday 22 January ..... 10:00 am to 3:00 pm; 5:30 to 7:30 pm
Thursday 23 January ..... 10:00 am to 4:00 pm

See the leading Electronic Imaging companies showcase the latest products and technologies in the industry. The current exhibitor list and floor plan is available online at www.electronicimaging.org.

There is no charge to visit the exhibition hall; however, a registration badge is required for admittance. Onsite registration is available for exhibition-only visitors.

For information about exhibiting at this symposium, please contact SPIE Exhibitions Department at exhibitions@spie.org; telephone +1 360 676 3290; fax: +1 360 647 1445; Web: www.spie.org/exhibitions/ei

## Messages for Attendees

Messages for attendees at Electronic Imaging 2003 Symposium can be left by calling the IS&T/SPIE Message Center at **408-748-7102**. Messages will be taken during registration hours Tuesday through Thursday. On Monday only, messages will be received at the Westin Hotel short course desk (**408-986-0700 ask for EI 2003)**

Attendees should check the message boards at the message center on a daily basis to receive their messages.

## IS&T Bookstore and Membership Booth

Tuesday through Thursday, ..... Open during registration hours

IS&T publishes a variety of books to meet your needs. Proceedings of past IS&T conferences including *Digital Printing Technologies, Color Imaging* as well as *Recent Progress* series books will be available. IS&T also distributes selected titles from cooperating publishers of science and technology books in the imaging field. Information about upcoming IS&T conferences and IS&T membership benefits, sample journals, and newsletters are available.

## SPIE Bookstore and Membership Booth

Tuesday through Thursday, ..... Open during registration hours

SPIE publishes a variety of technical books designed to meet diverse research, reference, and educational needs. Proceedings of SPIE technical conferences from this and related meetings may be purchased at the bookstore. Also available are related books in the SPIE PRESS Series, including Tutorial Texts, Milestone Series of Selected Reprints, Critical Reviews in Science & Technology, and Monographs & Handbooks.

## Job Seekers

ONLINE RECRUITING AND CAREER SERVICES

Target the technical professionals or employers you want to reach. Both employers and job seekers are encouraged to post positions and resumes/CVs to SPIE's online employment website—SPIEWorks. Membership in SPIE is not required.

**Employers**

Plan ahead and take advantage of FREE job posting services. That's right, there's no charge to post jobs to SPIEWorks Online Career Expos held in conjunction with numerous SPIE conferences. Go to spieworks.com/careerexpos for a listing of this years events.

**Job Seekers**

Land an exciting new job with a top-notch company. Post your resume/CV to SPIEWorks and put yourself in front of today's most sought-after employers. Go to **spieworks.com.**

## Desserts

Desserts will be served in the exhibition halls on Wednesday and Thursday, 3:00 to 4:00 pm. You will receive a ticket in your registration packet upon arrival at the meeting.

Cash Cart - Breakfast Breads, Snacks and Quick Lunch

Breakfast Service

*Santa Clara Convention Center, Main Lobby*

Tuesday through Thursday . . . . . 7:30 am to 8:30 am

Luncheon and Snack Service

*Santa Clara Convention Center, Main Lobby*

Tuesday . . . . . 11:00 am to 2:30 pm

Luncheon and Snack Service

*Santa Clara Convention Center, Exhibit Hall*

Wednesday and Thursday, . . . . . during exhibit hours.

The Cash Cart will offer breakfast breads, yogurt, fruit, coffee, juice and other beverages each morning of the conference. Luncheon and snack service will include deli-style sandwiches, salads, snacks and pastries, and beverage.

Attendees will need to make their own breakfast and lunch arrangements for Monday and Friday.

## Copy Center – San Diego Copy Center

Tuesday through Friday during registration hours copy services will be available for symposium attendees. The rates are 5 cents/copy and $1 per transparency. Located near registration in Hall A.

## Poster Session

*Exhibition Hall A*

Wednesday 22 January . . . . . 5:30 pm to 7:30 pm

Conference attendees are invited to the poster session Wednesday evening. Authors of poster papers will be on hand during these sessions to answer questions and provide in-depth discussion concerning their papers. Attendees are requested to wear their conference registration badges to the poster sessions.

Authors can set up posters after 9:00 am on Wednesday. Poster supplies (pushpins) will be available in Exhibition Hall A. Other supplies can be obtained from the Speakers Audio Visual Desk.

Posters can be previewed during the days of the events before the formal poster sessions begin at 5:30 pm.

Authors must remove their papers at the conclusion of the poster reception for that day. It is the author's responsibility to remove their posters. Papers not removed will be considered unwanted and will be discarded. The Societies assume no responsibility for posters left up after the end of each night's poster reception.

## New This Year! All-Conference Banquet

Thursday 23 January . . . . . 7:30 pm to 9:30 pm

Plan to join us for this great opportunity to get to know your Electronic Imaging colleagues. All attendees are invited to relax, and enjoy a pleasant dinner with friends old and new! Please order your discounted ticket in advance by checking the box on the conference registration form. (US$30)

## Child Care

Child sitting services available in San Jose:

1. Bay Area 2nd MOM Inc., Hotel Nanny Service, Phone: 1-888-926-3666
2. Bay Area Sitters Unlimited (408) 452-0225

Note: IS&T/SPIE does not imply an endorsement or recommendation of these services. They are provided on an "information only" basis for your further analysis and decision. Other services may be available.

## Letters of Invitation

Individuals requiring letters of invitation to obtain travel visas may access and print an invitation Letter Request Form found at this web site: `http://spie.org/forms/invitationrequest.pdf`

Please fill out a separate form for each person requesting a letter. All letters of invitation will be sent by airmail and by PDF e-mail attachment unless a courier account number or credit card number with expiration date is provided with the original request. Please allow ample time for processing requests. IS&T/SPIE are not able to contact U.S. Embassies in support of an individual attempting to gain entry to attend an IS&T/SPIE meeting.

# Travel Information

## Transportation Notes

Santa Clara is located at the southern point of San Francisco Bay in the heart of Silicon Valley. The Santa Clara Convention Center, and Westin Hotel Santa Clara are located 5 miles (8 kilometers) north of the San Jose Airport. The area is also served by San Francisco International Airport. (Shuttle service from this airport to the hotel will add about 1 hour 15 minutes to your travel time.)

The Santa Clara Convention Center (5001 Great America Parkway) is adjacent to the Westin Hotel Santa Clara, the headquarters hotel for Electronic Imaging 2003. Recreation is close at hand with the Santa Clara Golf and Tennis Club.

## Local Transportation Options

**The Super Shuttle Transportation from San Francisco Airport to Santa Clara Hotels**

The **Super Shuttle** runs from the **San Francisco Airport to Santa Clara hotels**. The fare to the Westin Santa Clara or the Santa Clara Marriott is **$36.00** for the first person one way and **$8.00** for each additional person in the same group. The Shuttle runs 24 hours per day 7 days per week. Cash, credit cards and US Travelers Checks are accepted. On arriving at the SFO airport, claim your luggage on the lower level. Proceed to the upper level and outside to the outer curb. Follow the blue SuperShuttle signs to the uniformed Airport Guest Coordinators in blue jackets. They will arrange SuperShuttle transportation to your destination. The Super Shuttle reservation number is 415-558-8500 or online at www.supershuttle.com.

**The South and East Bay Shuttle - Transportation from the San Jose Airport or San Francisco Airport to Santa Clara Hotels**

From the **San Jose Airport** to **any** downtown Santa Clara Hotel the fare is **$17.00** for the first person and **$6.00** for each additional person in the same group. Rates are subject to change without notice. The shuttle runs approximately every half hour, 24 hours per day. From San Jose Airport baggage area, use the courtesy phone to dial #66; you will be given instructions on where to catch the shuttle. The shuttle will pick you up within 15-20 minutes. The trip takes approximately 30 minutes. Advance reservations are also accepted - call 408-225-4444.

To reserve a whole van for up to 7 passengers, the flat rate fare is $49.00, advance reservations are required to reserve a van.

From the **San Francisco Airport** to **any** downtown Santa Clara Hotel**,** the fare is **$29.00** for the first person and **$7.00** for each additional person in the same group. Rates are subject to change without notice. The shuttle runs approximately every half hour, 24 hours per day.

From San Francisco Airport baggage area DEPARTURE LEVEL, call (408) 225-4444 or 1-800-548-4664 to arrange for a pick up, you will be given instructions on where to catch the shuttle. The shuttle will pick you up within 15-20 minutes. The trip takes approximately 1 hour and 15 minutes. Advance reservations are also accepted, call (408) 225-4444.

To reserve a whole van for up to 7 passengers, the flat rate fare is $79.00, advance reservations are required to reserve a van.

**The South Bay Flyer Transportation between San Francisco International Airport and San Jose Airport**

**The South Bay Flyer -** www.southbayflyer.com

The South Bay Flyer makes scheduled runs **between San Francisco International Airport and the San Jose Airport.**

Departures **from San Francisco Airport** begin from the new International Terminal from 6:50 am to 9:30 pm (not quite hourly, call for exact times), via the South Terminal to the North Terminal. Departures from the North Terminal begin 10 minutes later. The South Bay Flyer picks up and drops off from the International Terminal at Courtyard "A", lower level. At the south and north terminals, pickup is by the blue pillars across from each baggage claim, center isle, on the lower level. Drop off is curbside in front of the airline counters.

The cost either way is $20 (children under age 2 are free). Senior's (56+), airline personnel, students with ID and military in uniform pay $12. Traveling time is approximately 45 minutes. Cash or traveler's checks accepted (no credit cards or personal checks). Advance reservations are not required. Call South Bay Flyer for details at 888-463-5937 (408-566-0436 outside of North America) or their website at www.southbayflyer.com or www.landyacht.com/sbf/. From the website, print out a discount coupon for $2.00 off any round trip tickets.

Departures **from the San Jose Airport** to San Francisco Airport begin from 5:35 am through 7:45 pm (not quite hourly-phone for exact times). From San Jose Airport, catch the South Bay Flyer from Terminal "A" by exiting the baggage claim, go left along sidewalk to end of parking garage. Cross over to the center island, protected by glass canopy. From Terminal "C", depart from the Shelter directly across the street when exiting baggage claim. The South Bay Flyer is a blue & gray bus with blue and white South Bay Flyer signage on the front and sides and red and blue United Airlines insignia. For pickup, signal to the driver as he pulls up that you require a ride.

**Taxi Service from San Jose Airport to Santa Clara Hotels**

As per Checker Cab (408) 293-1199:

Fare from San Jose Airport to Westin Santa Clara is approximately $16 (5 miles).

Fare from San Jose Airport to Santa Clara Marriott is approximately $12 (4 miles).

**By Car from San Jose Airport to the Westin Santa Clara:** The Westin Hotel is located at 5105 Great America Parkway, Santa Clara, California. The Santa Clara Convention Center is adjacent to the hotel. To drive to the hotel and Convention Center from San Jose Airport - turn left out of the Airport onto Hwy. 87 North/Guadalupe Pkwy, then take 101 North. From 101 North, exit east (right) onto Great America Pkwy. Exit. The Westin is located immediately on your right after you cross over Tasman Drive.

**From San Francisco:** To reach the hotel and convention center from San Francisco take 101 South to the Great America Parkway exit, exit East. The Westin is located immediately on your right after you cross over Tasman Drive.

## Light Rail (San Jose/Santa Clara)

Attendees are encouraged to make use of the excellent, inexpensive commuter light rail system. The Westin Hotel Santa Clara and Convention Center are adjacent to the light rail transit line which extends from South San Jose to Santa Clara. Light rail transit stations connect with a number of bus routes.

## Parking

**Electronic Imaging attendees** may park in the complimentary parking garage located behind the **Westin** and Santa Clara Convention Center or utilize the Westin's valet parking service.

## Travel Arrangements

UNITED AIRLINES

United Airlines is offering special meeting fares for all attendees of the Electronic Imaging Meeting who use United's Special Meeting Desk to book their reservations. Book early and take advantage of the discounted fares that give you the greatest savings!

Several pricing options are purchasable based upon your dates of travel to the Electronic Imaging Meeting. You may choose a 5% discount off the lowest applicable fare or a 10% discount off the unrestricted coach fare, when tickets are purchased 0 days in advance. **An additional 5% discount will apply when you purchase your tickets at least 30 days in advance of your travel date.** Or you may choose Area Pricing, which are set air fare prices based upon geographical locations. Discounts apply on all United, and United Express domestic flights.

United does not offer International discounts for passengers departing from other countries due to International Tariff Restrictions. United **can** offer international discounts outbound from the United States. United will provide to attendees of the meeting, round trip transportation on any true United international flights (not partnered with another airline) at fares with either a 10% discount off the lowest applicable fare (excluding first class) or 15% off the unrestricted coach fare, when tickets are purchased 7 days in advance. **An additional 5% discount will apply when tickets are purchased at least 30 days in advance of the travel date.**

You or your travel agent must call United's Specialized meeting Reservations Center, a toll-free number at 1-800-521-4041 and provide the agent with the **Meeting ID Number 511CV.** Dedicated reservationists are on duty 7 days a week, 8:00 am to 10:00 pm EST. Book early to take advantage of promotional fares that give you the greatest discount. Mileage Plus members receive full credit for all miles flown to this meeting.

United's convenient schedule and discounted fares are available when you or your travel agent:

- Call United Airlines at 1-800-521-4041, from Canada or the United States
- Give them the Meeting ID number 511CV
- Identify the SPIE meeting you are attending

Discounts apply on United Airlines Travel conducted between January 13 – January 31, 2003.

Hertz®

**Hertz Car Rental** has been selected as the official car rental agency for this Symposium. To reserve a car, identify yourself as a **Electronic Imaging Meeting attendee** using the **Hertz Meeting Code CV# 029B0004.**

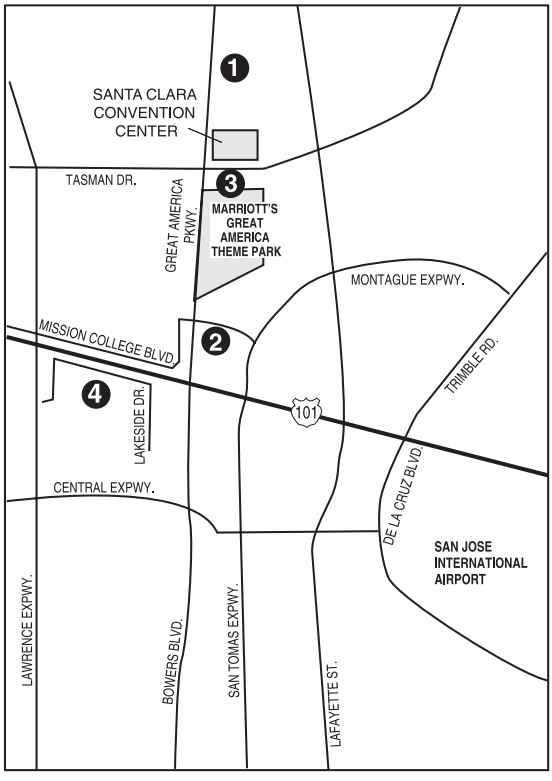
In the United States call 800-654-2240. In Canada call 1-800-263-0600, or 416-620-9620 in Toronto. In Europe and Asia call the nearest Hertz Reservation Center or travel agent. Outside of these areas call 405-749-4434. Or Book on-line at www.hertz.com by following the links through 9 easy steps starting with "Get a Quote – Reserve a Car" through step 7 where the "Meetings and Conventions" prompt requests the Convention (CV) # 029B0004 to receive the convention rates or lower rates which may be available at the time. In step 8, select "I want Hertz to find the lowest rate". Step 9 summarizes the entire reservation and quotes a rate. The rate presented is derived from searching multiple discount plans and special offers to find the best rate at the time, given applicable constraints.

Discount Convention Rates as follows:

| | Daily | Weekly |
|---|---|---|
| Economy (2DR): | $35.99 | $135.99 |
| Compact (4DR): | $40.99 | $149.99 |
| Mid-size (2/4DR): | $44.99 | $169.99 |
| Sporty (2DR) | $46.99 | $183.99 |
| Full-size (4DR): | $49.99 | $199.99 |
| Towncar: | $65.99 | $274.99 |
| Minivan: | $69.99 | $289.99 |

Rates include free unlimited mileage and are guaranteed one week before through one week after the actual meeting dates. At the time of reservation booking, these rates will automatically be compared to Hertz published rates, assuring that you are quoted the best comparable rate.

Standard rental qualifications apply. Taxes, vehicle licensing fees/ tax reimbursement/ transportation fees and optional items, such as refueling, are extra. At some locations, an airport access fee of up to 10% may apply, but usually only if you choose to exit on the Hertz courtesy bus. At many airports and hotels, up to 12% airport/hotel concession fee recovery applies on car rental.




## Hotel Locations

*See page 68 for Hotel Reservation Form.*

Headquarters Hotel:
**1. The Westin Santa Clara Hotel**
5101 Great American Parkway
Santa Clara, California 95054

**2. The Santa Clara Marriott Hotel**
2700 Mission College Boulevard
Santa Clara, California 95054

**3. The Hilton Santa Clara Hotel**
4949 Great America Parkway
Santa Clara, California 95054

**4. The Plaza Suites**
3100 Lakeside Drive
Santa ClaraCalifornia 95054

**5. The Mariani's Inn & Restaurant**
2500 El Camino Real
Santa Clara, California 95051

# Hotel Reservations

**Hotel Reservation Deadline 15 December 2002**

**Hotel Reservations:** We encourage attendees to use the Hotel Reservation Request Form to reserve your room at the headquarters hotel, The Westin Santa Clara Hotel. In the event that the headquarters hotel becomes fully booked your reservation request will automatically be referred to one of the overflow hotels listed below. Hotels will confirm your reservation directly to you. If you prefer to reserve a room at one of the hotels listed below, please contact the hotel of your choice directly to make reservations. Be sure to mention IS&T/SPIE Electronic Imaging 2003 in order to receive discounted rates. Reduced rates cannot be guaranteed after the block has been filled.

A special block of rooms at a discounted rate is being held at The Westin Santa Clara Hotel for IS&T/SPIE attendees for the nights of January 19 through January 24, 2003. The discounted rate will also be extended for 3 days before and after these dates if space is available. Reservations will be assigned on a priority basis to the EI '03 group provided they are received by December 15, 2002. In order to guarantee your room, a deposit equal to one night's housing must accompany your reservation request. Deposits can be made using a check or a major credit card number, expiration date and signature. Departure date will be verified upon arrival at the hotel, early departure for non-emergency reasons may be subject to a one time fee of $50.

*Hotel locations shown on previous page.*

Headquarters Hotel:
**1. The Westin Santa Clara Hotel**
5101 Great American Parkway
Santa Clara, California 95054

Deadline Date: December 15, 2002
Discounted EIo3 rate: Single $179 Double $179
(Plus state, local and tourism tax, currently 9.6% per day.

**2. The Santa Clara Marriott Hotel**
2700 Mission College Boulevard, Santa Clara, California 95054
Phone: 408-988-1500, ask for reservations; Fax: 408-980-3939
Discounted EI '03 Rate: Single - $159 Double - $159
(Plus state, local and tourism tax, currently 9.6% per day.

**3. The Hilton Santa Clara Hotel**
4949 Great America Parkway, Santa Clara, California 95054
Phone: 408-330-0001, ask for reservations; Fax: 408-330-0011
Discounted EI '03 Rate: Single - $169 Double/King - $169
(Plus state, local and tourism tax, currently 9.6% per day.

**4. The Plaza Suites**
3100 Lakeside Drive, Santa Clara, California 95054
Phone: 408-748-9800, ask for reservations; Fax: 408-986-1465
Discounted EI '03 Rate: Single - $159 Double/King - $169
(Plus state, local and tourism tax, currently 9.6% per day.

**5. The Mariani's Inn & Restaurant**
2500 El Camino Real, Santa Clara, California 95051
Car Recommended. (appx. 6 miles)
Phone: 408-243-1431, ask for reservations; Fax: 408-243-5745
Discounted EI '03 Rate: Single - $89 Double- $99 Suite: $99
(Plus state, local and tourism tax, currently 9.6% per day.

## Hotel Reservation Form

IS&T/SPIE's Electronic Imaging 2003
January 20 to 24, 2003
Headquarters Hotel, The Westin Santa Clara, Santa Clara, California

**Reservations Deadline - December 15, 2002**

Send this form to: Reservations Manager, Attn: IS&T/SPIE's EI'03
**The Westin Santa Clara Hotel**
5101 Great American Parkway
Santa Clara, California 95054

Name _____ No. in party _____

Company _____

Mailing Address _____

Telephone _____ Fax _____

Email _____

Arrival Date_____ Time_____ Departure Date _____

Names of additional room occupants: _____

Payment Method: ❑ Check ❑ AMEX ❑ MC ❑ VISA Check # _____

Card# _____ Exp. Date _____

Signature_____

In the event of cancellation, 72 hours notice must be made in writing to the hotel so that you may receive a full refund of your deposit. Check in time is 3:00 p.m. Check out time is 12:00 noon. There is no charge for children under 18 years when sharing a room with their parents. Please advise the hotel of any change in date or plan: 1-888-627-8405, or 408-986-0700, ask for reservations; Fax: 408-980-3939

Please reserve my room as indicated: ❑ Single - $179 ❑ Double - $179 (Plus state, local and tourism tax, currently 9.6% per day.
❑ Special requirements ❑ Smoking ❑ Non-Smoking (can be requested but not guaranteed until check-in based on availability.)

# Electronic Imaging
## Science and Technology

# Proceedings

*Order Proceedings volumes now and receive low prepublication prices.*

**Projection Displays IX**
*Editor*: Ming Hsien Wu, Hamamatsu Corp.
Approx. 20 papers • Proc. of SPIE Vol. **5002**
*Prepublication price:* **$53**

**Liquid Crystal Materials, Devices, and Applications IX**
*Editor*: Liang-Chy Chien, Kent State Univ.
Approx. 28 papers • Proc. of SPIE Vol. **5003**
*Prepublication price:* **$53**

**Poly-Silicon Thin Film Transistor Technology and Applications in Displays and Other Novel Technology Areas**
*Editor*: Apostolos T. Voutsas, Sharp Labs. of America, Inc.
Approx. 30 papers • Proc. of SPIE Vol. **5004**
*Prepublication price:* **$60**

**Practical Holography XVII and Holographic Materials IX**
*Editors*: Tung H. Jeong, Lake Forest College; Sylvia H. Stevenson, DuPont Holographic Materials
Approx. 64 papers • Proc. of SPIE Vol. **5005**
*Prepublication price:* **$90**

**Stereoscopic Displays and Virtual Reality Systems X**
*Editors*: Andrew J. Woods, Curtin Univ. of Technology (Australia); John O. Merritt, The Merritt Group; Stephen A. Benton, MIT Media Lab.; Mark T. Bolas, Fakespace Inc.
Approx. 68 papers • Proc. of SPIE Vol. **5006**
*Prepublication price:* **$90**

**Human Vision and Electronic Imaging VIII**
*Editors*: Bernice E. Rogowitz, IBM Thomas J. Watson Research Ctr.; Thrasyvoulos N. Pappas, Northwestern Univ.
Approx. 48 papers • Proc. of SPIE Vol. **5007**
*Prepublication price:* **$70**

✔ **Color Imaging VIII: Processing, Hardcopy, and Applications**
*Editors*: Reiner Eschbach, Xerox Corp.; Gabriel G. Marcu, Apple Computer, Inc.
Approx. 61 papers • Proc. of SPIE Vol. **5008**
*Prepublication price:* **$90**

**Visualization and Data Analysis 2003**
*Editors*: Robert F. Erbacher, Univ. at Albany; Philip C. Chen, Future, Inc.; Jonathan C. Roberts, Univ. of Kent at Canterbury (UK); Matti Gröhn, Helsinki Univ. of Technology (Finland); Katy Borner, Indiana Univ.
Approx. 45 papers • Proc. of SPIE Vol. **5009**
*Prepublication price:* **$70**

✔ **Document Recognition and Retrieval X**
*Editors*: Tapas Kanungo, IBM Almaden Research Ctr.; Elisa H. BarneySmith, Boise State Univ.; Jianying Hu, Avaya Labs. Research; Paul B. Kantor, Rutgers Univ.
Approx. 41 papers • Proc. of SPIE Vol. **5010**
*Prepublication price:* **$70**

**Machine Vision Applications in Industrial Inspection XI**
*Editors*: Martin A. Hunt, nLine Corp.; Jeffery R. Price, Oak Ridge National Lab.
Approx. 42 papers • Proc. of SPIE Vol. **5011**
*Prepublication price:* **$70**

**Real-Time Imaging VII**
*Editors*: Nasser Kehtarnavaz, Univ. of Texas/Dallas; Phillip A. Laplante, The Pennsylvania State Univ.
Approx. 22 papers • Proc. of SPIE Vol. **5012**
*Prepublication price:* **$53**

✔ **Videometrics VII**
*Editors*: Sabry F. El-Hakim, National Research Council Canada; Armin Gruen, ETH Zurich (Switzerland); James S. Walton, 4D Video
Approx. 39 papers • Proc. of SPIE Vol. **5013**
*Prepublication price:* **$60**

**Image Processing: Algorithms and Systems II**
*Editors*: Edward R. Dougherty, Texas A&M Univ.; Jaakko T. Astola, Karen O. Egiazarian, Tampere Univ. of Technology (Finland)
Approx. 57 papers • Proc. of SPIE Vol. **5014**
*Prepublication price:* **$80**

**Applications of Artificial Neural Networks in Image Processing VIII**
*Editors*: Nasser M. Nasrabadi, Army Research Lab.; Aggelos K. Katsaggelos, Northwestern Univ.
Approx. 21 papers • Proc. of SPIE Vol. **5015**
*Prepublication price:* **$53**

**Computational Imaging**
*Editors*: Charles A. Bouman, Purdue Univ.; Robert L. Stevenson, Univ. of Notre Dame
Approx. 30 papers • Proc. of SPIE Vol. **5016**
*Prepublication price:* **$60**

**Sensors and Camera Systems for Scientific, Industrial, and Digital Photography Applications IV**
*Editors*: Morley M. Blouke, Scientific Imaging Technologies, Inc.; Nitin Sampat, Rochester Institute of Technology; Ricardo J. Motta, PIXIM, Inc.
Approx. 40 papers • Proc. of SPIE Vol. **5017**
*Prepublication price:* **$70**

✔ **Internet Imaging IV**
*Editors*: Simone Santini, Univ. of California/San Diego; Raimondo Schettini, DISCO, Univ. of Milano Bicocca (Italy)
Approx. 35 papers • Proc. of SPIE Vol. **5018**
*Prepublication price:* **$60**

✔ **Multimedia Computing and Networking 2003**
*Editor*: Ragunathan Rajkumar, Carnegie Mellon Univ.
Approx. 21 papers • Proc. of SPIE Vol. **5019**
*Prepublication price:* **$53**

**Security and Watermarking of Multimedia Contents V**
*Editors*: Edward J. Delp, Purdue Univ.; Ping Wah Wong, IDzap, LLC
Approx. 74 papers • Proc. of SPIE Vol. **5020**
*Prepublication price:* **$100**

✔ **Storage and Retrieval for Media Databases 2003**
*Editors*: Minerva M. Yeung, Intel Corp.; Rainer W. Lienhart, Intel Corp.; Chung-Sheng Li, IBM Thomas J. Watson Research Ctr.
Approx. 54 papers • Proc. of SPIE Vol. **5021**
*Prepublication price:* **$80**

**Image and Video Communications and Processing 2003**
*Editors*: Bhaskaran Vasudev, Epson Palo Alto Lab.; T. Russell Hsing, Telcordia Technologies, Inc.; Andrew G. Tescher, AGT Associates; Touradj Ebrahimi, Swiss Federal Institute of Technology (Switzerland)
Approx. 149 papers • Proc. of SPIE Vol. **5022**
*Prepublication price:* **$150**

✔ **Indicates volumes that will be available at the meeting. Other Proceedings will be available 10–12 weeks after the meeting.**

## NEW!
## Electronic Imaging 2003
Proceedings on CD-ROM

Full-text papers from all 21 Proceedings volumes. PC, Macintosh, and Unix compatible.

**Electronic Imaging 2003**
(Includes Vols. 5002–5022)
Order No. CDS79 • Est. pub. July 2003
Meeting attendee: $130
Nonattendee member prepublication price: $1075
Nonattendee nonmember prepublication price: $1415

## Can't Attend?
Don't miss out on the latest technical discoveries and education opportunities presented at Electronic Imaging 2003. Order the Proceedings volumes and CD-ROM from this meeting using the registration form on p. 71. It's the next best thing to being there.

# Registration Information

## 1. Name and Address

Fill in the information in this section completely. Your registration badge will reflect this information.

***IS&T/SPIE Members:*** write your ID Number in the boxes provided. Your reduced fees appear under the *Member* column in the rate schedules.

**Full registration includes admission to all regular sessions, the exhibit, the final program/ abstract book, dessert tickets, and the opportunity to purchase a banquet ticket ($30). Separate registration fees are required for the short courses as noted on pages 50-62.**

Short courses are priced separately.

It's fast and easy.
Follow these guidelines and fill in the form on the opposite page. Then just fax or mail the form to IS&T.

You can also register on the Web:
www.electronicimaging.org

## 2. Membership—Immediate Benefits!

Join IS&T or SPIE today and realize an immediate savings on registration for this symposium. See p. 72 for benefits of becoming a member of IS&T or SPIE. Check the box by the Membership category you choose, enter the amount of your dues, and register at member rates.

Full IS&T Membership ($90 USA/$100 outside USA)
IS&T Student Membership ($25)
Full SPIE Membership with choice of journal ($95)
SPIE Student Membership ($40 with choice of journal, $20 no journal)

You can also join the IS&T/SPIE **Electronic Imaging Technical Group.** See page 5 for more information. $15 IS&T/SPIE Member; $30 Nonmembers.

## 3. Symposium Registration

To determine your fees consider the following:

- If you are a Member of IS&T or SPIE or if you join now, use the prices in the left column.
- If you are part of the technical program (i.e., **author, session chair, program committee member**) at this symposium, use the prices under that heading.
- Select your *Proceedings*
  Taxes and shipping are included in your registration fees.

CD-ROM Options for Attendees of Electronic Imaging 2003.

Full-text papers from all 21 Proceedings volumes.
PC, Macintosh, and Unix compatible.

**Electronic Imaging 2003**
(Includes Vols. 5002–5022)
Order No. CDS79
Est. pub. July 2003
Meeting attendee: $130
Nonattendee member prepublication price: $1075
Nonattendee nonmember prepublication price: $1415

**Registration and Payment must be received by 20 December 2002**

## 4. Short Courses

See the Short Course descriptions on pp. 50-62 to determine prices. Fill in the course number (e.g., SC078) and the price for each course you are registering for. **IS&T/SPIE members receive substantial discounts**. Short Course registration is independent of conference registration.

## 5. Banquet *Tickets are nonrefundable.*

**Electronic Imaging Symposium Banquet** • Thursday 23 January • 7:30 to 9:30 pm. Tickets: $30 each.
Advance registration required.

## 6. Additional Proceedings/CD-ROM-Only Orders

You can purchase additional Proceedings Volumes and Conference Proceedings on CD-ROM (besides those already included in your registration fee). See p. 69 and take advantage of the special prepublication prices offered to attendees. If you can't attend, you can still receive the special prices. Fill in the item number(s) and price(s) you wish to order. Figure your shipping costs and taxes (below) and transfer these numbers to the registration form at right.

**Tax and Shipping for Proceedings and CD-ROMs.**

**Taxes:** CA, FL, and WA state residents add applicable sales tax. Canadian residents add 7% GST ..... $_____

**Shipping (print proceedings only):** add 5% in N. America or 10% outside N. America ..... $_____

Cancellations made one month before the meeting will be refunded in full. Late cancellations will be charged $55.00 USD.

## 7. Payment Method

This form will NOT be processed if payment is not included or if your signature is not included when paying by credit card. Please complete all information.

**Fees will increase $100 after 20 December 2002**

**Register & Pay Today!**

## 1. Name and Address

IS&T/SPIE ID # _____

First Name _____ MI. _____ Last Name _____

Title _____

Company _____

Address (include Mail Stop) _____

City _____ State _____ Zip/Postal Code _____

Country other than USA _____

Phone _____ Fax _____

E-Mail Address _____ Date of Birth _____

**Preregistration for**
**IS&T/SPIE Electronic Imaging**
20-24 January 2003
Santa Clara Convention Center
Santa Clara, California USA

Mail or fax this form to
IS&T, 7003 Kilworth Lane
Springfield, Virginia 22151 USA
Tel: +1 703 642 9090; Fax: +1 703 642 9094
Web: www.electronicimaging.org
**Submit one form per person.**

CODE: **3452**

## 2. Membership *(See prices on facing page.)*

❑ Renew or ❑ New membership:

IS&T ($90 USA/$100 outside USA; Student $25 with choice of Journal)
❑ IS&T Full Membership ❑ IS&T Student Membership

SPIE ($95; Student $20 no journal; $40 with choice of journal)
❑ SPIE Full Membership ❑ SPIE Student Membership (❑ with journal ❑ no journal)

**Journal of Electronic Imaging**
**Journal format** (choose one)
**❑ print ❑ online**

❑ I wish to join the Technical Group ($15 each): ❑ Electronic Imaging ❑ Holography

**Membership Total**
$

## 3. Symposium Registration

| | IS&T/SPIE Mbr. | Nonmember |
|---|---|---|
| **❑ Attendee (TE)** | | |
| Full meeting with one proceedings | ❑ US$455 | ❑ US$515 |
| Full meeting with two proceedings | ❑ US$515 | ❑ US$575 |
| Full meeting plus one Symposium CD-ROM | ❑ US$585 | ❑ US$645 |
| **❑ Author (AU) Chair/Committee (CH)** | **IS&T/SPIE Mbr.** | **Nonmember** |
| Full meeting with one proceedings | ❑ US$395 | ❑ US$445 |
| Full meeting with two proceedings | ❑ US$455 | ❑ US$505 |
| Full meeting plus one Symposium CD-ROM | ❑ US$525 | ❑ US$575 |
| **❑ Full-time student (ST)** (no proceedings or CD-ROM) | ❑ US$ 90 | ❑ US$150 |
| Full meeting with one proceedings | ❑ US$140 | ❑ US$200 |
| Full meeting plus Symposium CD-ROM | ❑ US$220 | ❑ US$280 |

**Choose Registration Plan Proceedings Volumes Here:**
First Vol._____
Second Vol._____

❑ Register for **Photonics West** (Does not include proceedings). ❑ **US**$250
Photonics West is 25–31 January, San Jose, CA

❑ ♿ If, due to a disability, you have special needs or requirements, check here and IS&T will contact you.

**Registration Total**
$

## 4. Short Courses

Write the number(s) and price(s) of the courses/workshops you will attend.

SC ____ @ $_____ SC ____ @ $_____ SC ____ @ $_____ SC ____ @ $_____

**Short Courses Total**
$

**Banquet Total**
$

## 5. Banquet *Tickets $30 each. Indicate number desired. Tickets are nonrefundable.*

Please reserve _____ tickets for **Reinventing Photojournalism in the Digital Age Banquet,** at $30 each.

## 6. Publications

(See p. 69 for a complete list of Proceedings for this event).

Vol. _____@ $ _____ Vol. _____@ $ _____ Vol. _____@ $ _____ CD ____ @ $_____

Add'l Publications Tax & Shipping
(see worksheet on facing page)
$ _____

**Publications Total**
$

## 7. Payment Method

❑ Check _____ Amount $_____ (payable to IS&T)

**Payment must accompany registration.**

*Credit Card:*
❑ VISA
❑ MasterCard
❑ American Express
❑ Diners Club
❑ Discover

*Card Number:* | | | | | | | | | | | | | | | | |

*I authorize IS&T to charge total payment fee (as indicated on this form) to my credit card.*

Expiration Date _____ Month / _____ Year Signature_____

**TOTAL**
$

# Membership

*Stay connected to your industry through membership in these professional organizations.*

## IS&T The Society for Imaging Science and Technology

IS&T – The Society for Imaging Science and Technology is an international non-profit society whose goal is to keep members aware of the latest scientific and technological developments in the field of imaging through conferences, journals and other publications. We focus on imaging in all its aspects, with particular emphasis on digital printing, electronic imaging, photofinishing, silver halide imaging, image preservation, imaging systems, imaging quality, and color imaging.

IS&T membership dues are $90 domestic and $100 outside the U.S. per year. Benefits of membership include:

- Subscription to the Journal of Imaging Science and Technology or the Journal of Electronic Imaging
- Subscription to the IS&T Reporter - the "Window on Imaging", with regular features on standards, new products, conference reports and Society news
- IS&T Directory for Members
- Reduced rates for IS&T publications
- Reduced rates for IS&T meetings
  (We conduct 4 to 6 conferences each year on selected topics of imaging technology.)
- Access to member-restricted area on the IS&T web-site including full text search and free downloads of proceedings papers
- Student membership (non-voting member) ($25) includes all of the benefits mentioned above.

We invite you to join IS&T. Application forms and sample journals are available from the IS&T office.

For more information:

**Call: IS&T at 703/642-9090;**
**FAX: 703/642-9094;**
**E-mail: info@imaging.org**
**visit http://www.imaging.org**

## SPIE The International Society for Optical Engineering

Individual Membership

Joining SPIE as a regular member provides you with many benefits, including:

- Opportunity for professional growth
- Peer recognition; eligibility for election to Fellow; awards program
- Association, communication, and networking with colleagues
- Subscription to *oe magazine,* SPIE's monthly magazine
- Choice of subscription to any of SPIE's three peer-reviewed journals:
  - Optical Engineering (monthly)
  - Journal of Biomedical Optics (quarterly)
  - Journal of Electronic Imaging (quarterly)
- Continuing education
- Participation in and contribution to technical community
- Voting privileges
- Eligibility to hold SPIE office
- Career enhancement
- Access to Professional Group Benefits Program, including insurance, discount travel, and no-fee credit card
- Special member rates on meetings, publications and courses

*Retiree, Working Group, and Student Memberships are available at reduced rates. Authors presenting for the first time at an SPIE meeting are offered a complimentary six-month trial membership (not available to current past members).*

For more information contact SPIE:

**Call: +1 360 676 3290**
**FAX: +1 360 647 1445**
**E-mail: membership@spie.org**
**Web: www.spie.org**

## IS&T/SPIE Electronic Imaging Technical Group

Electronic imaging encompasses diverse research, engineering, and specialized applications of electronic imaging devices or systems. Because of the diverse topical areas within electronic imaging, the working group is divided into six subgroups that cover image processing, image capture, display and hardcopy, system integration, visualization, and low-light instrumentation. Application areas are just as far-reaching. They include industrial automation, graphic arts, aerospace sensing, remote sensing, high-resolution television, optimal fiber tele-imaging, document processing, medical imaging, and all areas of digital image processing, including restoration, compression, and analysis.

Joint sponsorship by the IS&T and SPIE provides even more benefits and contacts for members of the technical group through the close partnership of the two societies. Both IS&T and SPIE members may join the technical group at the member rate of just $15 per year.

Technical group benefits include:

- a twice-yearly newsletter covering events in the field
- an annual directory of members
- discounts on conference registration fees
- discounts on selected publications, including the SPIE/IS&T copublished quarterly *Journal of Electronic Imaging.*

*IS&T/SPIE's 15th Annual Symposium*

# Electronic Imaging

## Science and Technology

**20–24 January 2003**
Santa Clara Convention Center and Westin Hotel
Santa Clara, California USA

# *Invitation:*

We invite you to join IS&T—The Society for Imaging Science and Technology and SPIE—The International Society for Optical Engineering for the 15th Annual Symposium on Electronic Imaging: Science and Technology to be held at the Santa Clara Convention Center in Santa Clara, California. The 15th Symposium marks an important new phase for EI as a separate, stand-alone event. Photonics West will take place in San Jose the following week. Because of the growth and development of the EI Symposium, it has acquired a separate status to better serve the community of engineers and scientists engaged in the wide variety of EI fields. This will allow the sense of community to be strengthened and enhance the overall experience provided by EI: to share knowledge on the latest progress; to catch up on and explore new technologies and applications; to renew professional relationships as well as to make new ones; and to establish business contacts. The new location provides a range of plentiful hotel accommodations suitable for everyone's budget and is within easy reach of either the San Francisco or San Jose airport.

Electronic Imaging continues its tradition of providing conferences on new and exciting topics while remaining focused on core technologies spanning this increasingly diverse field of research. The conferences will continue to provide the depth necessary to today's researcher along with short courses, panel discussions, and poster sessions. Two outstanding plenary speakers will highlight the Symposium with exciting presentations of broad interest to all attendees. New for this year, there will also be a symposium-wide banquet.

Additional professional experiences for new and returning attendees will be provided by the conference receptions, the vendor exhibition, interest group meetings, and technology demonstrations that are part of every EI Symposium. The conference chairs and their technical committees represent a great resource for the newcomer who seeks ways to connect to the EI community and, perhaps, to eventually participate in organizing a conference. Becoming directly involved in EI is also an excellent way to develop contacts and learn who's who in the various fields. You and your family will find that the greater Bay Area, especially San Francisco, has much to offer in terms of culture, entertainment, and sightseeing. The weather in late January is often cool and sunny which makes for a most pleasant stay. EI 2003 is a major step forward for the Electronic Imaging community. Plan now to be a part of this new and exciting phase of this outstanding Symposium.

**John D. Meyer,** Hewlett-Packard Co.

**Robert A. Sprague,** Gyricon Media Inc.
*Symposium Chairs*

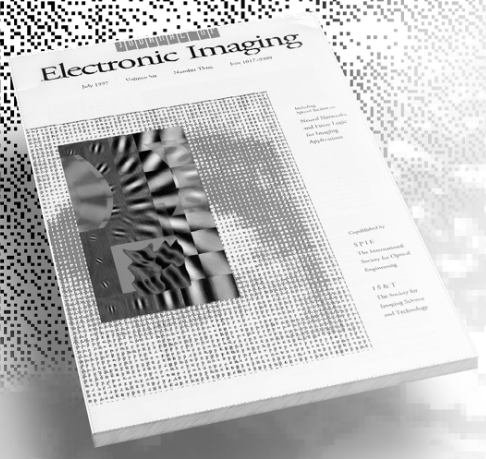
*IS&T/SPIE would like to express their deepest appreciation to the program chairs, conference chairs, cochairs, program committees, and session chairs who have so generously given of their time and advice to make this symposium possible. The symposium, like our other conferences and activities, would not be possible without the dedicated contribution of our participants and members.*

*This program is based on commitments received up to the time of publication and is subject to change without notice.*

*Symposium Organizing Committee:*
**Jean-Marc R. Fournier,** The Rowland Institute for Science
**John O. Merritt,** The Merritt Group

*Technical Organizing Committee:*
**Jaakko T. Astola,** Tampere Univ. of Technology (Finland)
**Elisa H. BarneySmith,** Boise State Univ.
**Stephen A. Benton,** MIT Media Lab.
**Morley M. Blouke,** Scientific Imaging Technologies, Inc.
**Mark T. Bolas,** Fakespace Labs., Inc. and Keio Univ. (Japan)
**Katy Börner,** Indiana Univ.
**Charles A. Bouman,** Purdue Univ.
**Philip C. Chen,** Future, Inc.
**Liang-Chy Chien,** Kent State Univ.
**Edward J. Delp,** Purdue Univ.
**Edward R. Dougherty,** Texas A&M Univ.
**Touradj Ebrahimi,** Swiss Federal Institute of Technology (Switzerland)
**Karen O. Egiazarian,** Tampere Univ. of Technology (Finland)
**Sabry F. El-Hakim,** National Research Council Canada (Canada)
**Robert F. Erbacher,** Univ. at Albany
**Reiner Eschbach,** Xerox Corp.
**Matti Gröhn,** Helsinki Univ. of Technology (Finland)
**Armin Gruen,** Swiss Federal Institute of Technology (Switzerland)
**T. Russell Hsing,** Telcordia Technologies, Inc.
**Jianying Hu,** Avaya Labs. Research
**Martin A. Hunt,** nLine Corp.
**Tung H. Jeong,** Lake Forest College
**Paul B. Kantor,** Rutgers Univ.
**Tapas Kanungo,** IBM Almaden Research Ctr.
**Aggelos K. Katsaggelos,** Northwestern Univ.
**Nasser Kehtarnavaz,** Univ. of Texas/Dallas
**Phillip A. Laplante,** The Pennsylvania State Univ.
**Chung-Sheng Li,** IBM Thomas J. Watson Research Ctr.
**Rainer W. Lienhart,** Intel Corp.
**Gabriel G. Marcu,** Apple Computer, Inc.
**John O. Merritt,** The Merritt Group
**Ricardo J. Motta,** PIXIM, Inc.
**Nasser M. Nasrabadi,** Army Research Lab.
**Thrasyvoulos N. Pappas,** Northwestern Univ.
**Jeffery R. Price,** Oak Ridge National Lab.
**Ragunathan Rajkumar,** Carnegie Mellon Univ.
**Jonathan C. Roberts,** Univ. of Kent at Canterbury (United Kingdom)
**Bernice E. Rogowitz,** IBM Thomas J. Watson Research Ctr.
**Nitin Sampat,** Rochester Institute of Technology
**Simone Santini,** Univ. of California/San Diego
**Raimondo Schettini,** DISCO, Univ. of Milano Biocca (Italy)
**Sylvia H. Stevenson,** DuPont Holographic Materials
**Robert L. Stevenson,** Univ. of Notre Dame
**Andrew G. Tescher,** AGT Associates
**Bhaskaran Vasudev,** Epson Palo Alto Lab.
**Apostolos T. Voutsas,** Sharp Labs. of America
**James S. Walton,** 4D Video
**Ping Wah Wong,** IDzap LLC
**Andrew J. Woods,** Ctr. for Marine Science and Technology/Curtin Univ. of Technology (Australia)
**Ming Hsien Wu,** Hamamatsu Corp.
**Minerva M. Yeung,** Intel Corp.

# Cited. Read. Respected.




JOURNAL OF
## Electronic Imaging

**2003 Special Topical Sections**

*April 2003:* **Imaging through Scattering Media**
*Guest Editors:* **Kevin Webb,** Purdue University; **Charles Bouman,** Purdue University; **David Boas,** Massachusetts General Hospital, Harvard Medical School

*October 2003:* **Retinex at 40**
*Guest Editors:* **John McCann,** McCann Imaging

**2003 JEI Subscription Rates:**

**Members*** Print $55; Online $30; Print + Online $85
**One print or e-journal included with SPIE or IS&T Membership*

**Nonmembers & Institutions** (Print + Online+)
**United States** $255; **Outside United States** $275
*+Requires signed subscriber agreement*

Published quarterly
Approx. 600 pages per year

Editor: **Jan P. Allebach, Purdue University**

Copublished by:
SPIE—The International Society for Optical Engineering
IS&T—The Society for Imaging Science and Technology

**Subscribe Today!**

Contact IS&T, 7003 Kilworth Lane Springfield, Virginia 22151
Phone: (1) 703/642-9090 • Fax: (1) 703/642-9094 • E-mail: info@imaging.org

Photonics WEST

25–31 January 2003 • San Jose, California USA

*Conferences • Courses • Exhibitions*

Join over 16,000 researchers, scientists, engineers, and business people from 75 industries and 48 countries focused on the future of light-driven technologies.

- Biomedical Optics
- Lasers and Applications
- Integrated Optoelectronic Devices
- Micromachining and Microfabrication

# Get the bird's-eye view

The week after Electronic Imaging 2003!

Register at reduced rates—see the registration form for details.

spie.org/info/pw

SPIE The International Society for Optical Engineering

Tel: +1 360 676 3290 • pw@spie.org