## HIGHLIGHTED PAPERS

### IS&T/SPIE Electronic Imaging Symposium 2012

**2011 Best Paper Award for Media Watermarking, Security, and Forensics 2012 Conference**

## Re-Synchronizing audio watermarking after non-linear time stretching

*Martin Steinebacha and Sascha Zmudzinskia, Fraunhofer SIT, and Stefan Nürnbergerb, TU Darmstadt (Germany)*

**Abstract:**  Digital audio watermarking today is robust to many common attacks, including lossy compression and digital-toanalogue conversion. One robustness and security challenge, still, is time-stretching. This operation speeds up or slows down the playback speed while preserving the tone pitch. Although inaudible for an uninformed listener if smoothly applied, time-stretching can be confusing for a blind watermark detection algorithm. We introduce a non-blind approach for reconstructing the original timing based on dynamic time warping. Our experiments show that the approach is successful even if non-linear stretching was applied. Our solution can significantly increase the robustness and security of every audio watermarking scheme that is dependent on precise timing conditions at detection time.

\* These papers were presented at Electronic Imaging Symposium, held January 22-26, 2012, in Burlingame, CA.

### Color in Graphics, Imaging, and Vision CGIV 2012

## Metamer Mismatch Volumes

*Alexander Logvinenko, Glasgow Caledonian University (Scotland); and Christoph Godau and Brian Funt; Simon Fraser University (Canada)*

**Abstract:** A new algorithm for evaluating metamer mismatch volumes is introduced. Unlike previous methods, the proposed method places no restrictions on the set of possible object reflectance spectra. Such restrictions lead to approximate solutions for the mismatch volume. The new method precisely characterizes the volume in all circumstances.

## Spatio-Temporal Retinex-like Envelope with Total Variation

*Gabriele Simone and Ivar Farup, Gjøvik University College (Norway)*

**Abstract:** Many algorithms for spatial color correction of digital images have been proposed in the past. Some of the most recently developed algorithms use stochastic sampling of the image in order to obtain maximum and minimum envelope functions. The envelopes are in turn used to guide the color adjustment of the entire image. In this paper, we propose to use a variational method instead of the stochastic sampling to compute the envelopes. A numerical scheme for solving the variational equations is outlined, and we conclude that the variational approach is computationally more efficient than using stochastic sampling.

\* These papers were presented at CGIV2012, held May 6-9, 2012, in Amsterdam, the Netherlands.

# INSIDE THIS ISSUE

**Image Quality and System Performance IX
Best Student Paper Award**

## How do we watch images?: a case of change detection and quality estimation

*Jenni Radun, Tuomas Leisti, Toni Virtanen, and
Göte Nyman, University of Helsinki (Finland)*

**Abstract:** The most common tasks in subjective image estimation are change detection (a detection task) and image quality estimation (a preference task). We examined how the task influences the gaze behavior when comparing detection and preference tasks. The eye movements of 16 naïve observers were recorded with 8 observers in both tasks. The setting was a flicker paradigm, where the observers see a non-manipulated image, a manipulated version of the image and again the non-manipulated image and estimate the difference they perceived in them. The material was photographic material with different image distortions and contents. To examine the spatial distribution of fixations, we defined the regions of interest using a memory task and calculated information entropy to estimate the spatial concentration of fixations. The quality task was faster and needed fewer fixations and the first eight fixations were more concentrated on certain image areas than in the change detection task. The bottom-up influences of the image also caused more variation to the gaze behavior in the quality estimation task than in the change detection task. The results show that the strategies for making the tasks are different and in subjective image estimation studies it is important to think about the task.

**Document Recognition and Retrieval 2012
Best Student Paper Award**
**Sponsored by Google**

## Construction of language models for an handwritten mail reading system

*Olivier Morillot and Laurence Likforman-Sulem, Télécom ParisTech and
CNRS LTCI; and Emmanuéle Grosicki, DGA (France)*

**Abstract:** This paper presents a system for the recognition of unconstrained handwritten mails. The main part of this system is an HMM recognizer which uses trigraphs to model contextual information. This recognition system does not require any segmentation into words or characters and directly works at line level. To take into account linguistic information and enhance performance, a language model is introduced. This language model is based on bigrams and built from training document transcriptions only. Different experiments with various vocabulary sizes and language models have been conducted. Word Error Rate and Perplexity values are compared to show the interest of specific language models, fit to handwritten mail recognition task.

**Digital Photography VIII
The Canon USA Best Paper Award**
**Sponsored by Canon USA**

## Optimal defocus estimates from individual images for autofocusing a digital camera

*Johannes Burge and Wilson S. Geisler; University of Texas at Austin (USA)*

**Abstract:**   Recently, we developed a method for optimally estimating defocus blur given a set of natural scenes, a wave-optics model of the lens, a sensor array, and a specification of measurement noise. The method is based on first principles and can be tailored to any vision system for which these properties can be characterized. Here, the method is used to estimate defocus in local areas of images (64x64 pixels) formed in a Nikon D700 digital camera fitted with a 50mm Sigma prime lens. Performance is excellent. Defocus magnitude and sign can be estimated with high precision and accuracy over a wide range. The method offers an alternative to both phase detection and contrast measurement auto-focus techniques. Like phase-detection, the method provides point estimates of defocus (magnitude and sign), yet it does not require specialized hardware. Like contrast measurement, the method is image-based and can operate in "Live View" mode, yet it does not require an iterative search for best focus. Thus, this new method has the advantages of both phase-detection and contrast measurement auto-focus techniques, without their disadvantages. The approach can be used to develop improved autofocus and depth estimation algorithms for computational vision systems.

**Digital Photography VIII
The BAE Systems Best Paper Award**
**Sponsored by BAE Systems**

## An efficient, multiple-exposure image fusion in JPEG domain

*Ramya S. M. Hebbalaguppe, Dublin City University (Ireland), and
Ramakrishna Kakarala, Nanyang Technological University (Singapore)*

**Abstract:**   An efficient method to fuse multiple images taken with varying exposure times in the JPEG domain is presented. The algorithm uses the spatial frequency analysis provided by the DCT within JPEG to combine the uniform regions of the longest-exposure image with the detailed regions of the short-exposure images, thereby reducing noise while providing sharp details. Advantages of the proposed method are great reduction in processing time, improved memory management, and efficient ghost removal in obtaining reasonably good quality HDR images.

Experiments show both quantitative and qualitative improvement over the short-long exposed images. Qualitatively, the fused image looks sharp with

# Highlights from IS&T/SPIE Electronic Imaging 2012 Symposium

*By Majid Rabbani, Symposium Chair*

The 24th annual IS&T/SPIE Electronic Imaging (EI) Symposium hosted 20 distinct conferences spanning six diverse technology areas: 3D Imaging, Interaction, and Measurement; Imaging, Visualization, and Perception; Image Processing; Digital Imaging Sensors and Applications; Multimedia Processing and Applications; and Visual Information Processing and Communication.

EI brings an international, multidisciplinary community of academic, industrial, and government researchers together under the same roof to explore the breadth of technologies represented. This year more than 1000 participants from 42 countries, with attendees from the US, Europe, Asia, and other continents.

Speaking as someone who has participated in all of the previous 25 EI symposia (starting with the 1988 meeting in LA), I was once again able to enjoy all of the attributes that make EI such a unique and rewarding component of my profes-

pher with colleagues from around the world.

## Plenary and Keynotes

The 2012 Symposium featured two morning plenary presentations. Bill Freeman (MIT) gave an insightful review of the field of Computational Photography, where novel image capture or manipulation capabilities can be achieved by modifications to either the camera lens, aperture, shutter, light source, or image sensor, and/or by designing algorithms appropriate for each camera modification. Although I had enjoyed keynote speeches on this topic before, Bill's presentation style and inclusion of results from other prominent researchers in this field made this a refreshing experience.

David Forsyth (University of Illinois at Urbana-Champaign) presented "More Words and Bigger Pictures," which reported on the state of the art in object recognition with an emphasis on methods



**EI2012**

| | |
|---|---|
| Attendees*: | 1065 |
| Oral Papers: | 572 |
| Interactive Papers: | 163 |
| Short Courses: | 16 |
| Dates: | January 22-26, 2012 |
| Location: | Burlingame, CA |

*includes Short Course only and guests



Antonio Neves's (University of Aberio, Portugal) NAO humanoid robot delighted Demonstration Session attendees.

## Short Courses

Short courses have always been a strong component of the EI program and 2012 was no exception. This year, 16 short courses were presented—7 of which were new—attracting a total of 181 attendees. Courses covered the broad areas of Displays (2D/3D); Image Processing/Understanding/Recognition; and Camera Systems (including mobile). New course "Objective and Subjective Image Quality Camera Benchmarking" (Hornung, Eliasson, and Phillips), achieved the 2012 attendance record of 30 students.



The Monday evening 3D Theater always draws a large audience eager to view experimental and mainstream 3D content from around the world.

sional experience. These include the opportunity to share the latest research results with colleagues; learn about the latest academic and industrial research in a diverse set of technical areas that complement my particular field of expertise; listen to the interesting symposium plenary speakers and conference keynotes; take a short course that saves me many weeks of learning; and network in a relaxing atmos-

for tagging images with words or phrases. David's unique approach to describing the inherent challenges in doing this, combined with the many interesting videos and examples illustrating the technical content, added much entertainment to this highly technical field.

A number of the conferences also featured keynote talks that drew numerous participants (see details, box on page 4).

## Other Conference Highlights

The popular Monday night 3D Theatre was hosted by Andrew Woods (Curtin Univ.) and Chris Ward (Lightspeed Design) as part of the Stereoscopic Displays and Applications conference. It showcased a wide variety of 3D content in high quality, polarized 3D, on a large-screen.

The Interactive Paper and the Symposium Demonstration Sessions, traditionally held on Tuesday, are among the most popular events of the conference and are also a

# CONFERENCE KEYNOTES

## Human Vision and Electronic Imaging XVII:
"The general solution to HDR rendering,"
John J. McCann (McCann Imaging)
"Measuring Material Perception,"
Laurence T. Maloney (NYU)
"Computational photography and the Stanford Frankencamera," Marc S. Levoy (Stanford)

## Stereoscopic Displays and Applications XXIII
"Panasonic's stereoscopic 3D technologies, standardization, and business strategy,"
Masayuki Kozuka (Panasonic)

## Visualization and Data Analysis Conference
"Data analysis using R," Patrick Hanrahan (Stanford)
"Imaging the Antikythera Mechanism,"
Thomas Malzbender (HP Labs)

## Parallel Processing for Imaging Applications II
"Compute infrastructure challenges of commercial digital print," I-Jong Lin (HP Labs)

## Computational Imaging X
"Definition of shape,"
Zygmunt Pizlo (Purdue University)

## Media Watermarking, Security and Forensics
"Watermarking and fingerprinting for audience measurement,"
Arun Ramaswamy (Nielsen Media Research)
"The Landscape of Mobile Payments,"
Darko Kirovski (Microsoft Research Cambridge)

## Multimedia Content Access: Algorithms and Systems VI
"Learning to recognize objects despite novel environments and sensors,"
Trevor Darrell (Univ. of California, Berkeley)
"Social Media Mining at the Billion Scale: Insights, Method and Practice for Analyzing Social Media in Facebook," Rong Yan (Facebook Inc.)

## Visual Information Processing and Communication III
"Developments toward high-efficiency video coding (HEVC)," by Gary J. Sullivan (Microsoft)
"Wavelets on graph: theory and applications to video coding," by Antonio Ortega (USC)
"More physics!: The benefits of incorporating near-infrared cues in image processing and computer vision tasks," Sabine Süsstrunk (EPFL)
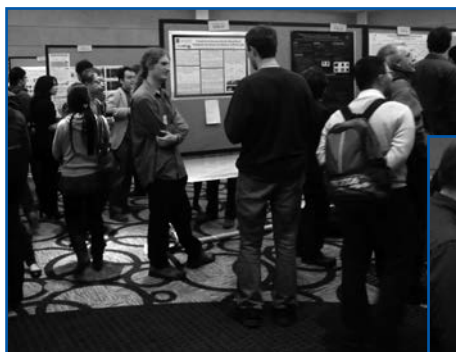


The Interactive Paper (poster) and Demonstration Session are always lively events where lots of information is exchanged.

Photos: Rob Whitner.



Short Course Chairs Choon-Woo Kim (far left) and Geoff Woolfe (far right) present the Distinguised Educator Award to EI Symposium Chair Majid Rabbani, who has taught short courses for the past 25 years at EI.

great venue for networking. The Interactive Session allows authors and attendees to engage in in-depth discussions about paper topics, while the Demonstration component of the session promotes interactive, hands-on demonstrations of hardware, software, displays, and research products related to all the topics covered by EI. The Demo session showcases the largest and most diverse collection of stereoscopic research and products in one location.

## Conference and Society Awards

The "2012 Electroing Imaging Scientist of the year" award—given to a member of the EI community who has demonstrated excellence and commanded the respect of his/her peers by making significant contributions to the field of electronic imaging via research, publications, or service—was given to Albert Theuwissen (Harvest Imaging, the Netherlands) for his seminal contributions to the fields of solid-state image capture and advanced image sensors. His daughter accepted the award on his behalf.

The Distinguished Educator Award was presented to Majid Rabbani (Kodak) in recognition of his 25 years as a short course instructor.

IS&T's presented its highest award—Honorary Membership—to Chang Yeong Kim (Samsung Advanced Institute of Technolgy), for worldwide leadership and accomplishments in color science and engineering. It was accepted by his co-worker Mahnjin Han. Other IS&T awards presented at EI were the Edwin H. Land Medal to Mary Lou Jepsen (One Laptop Per Child) for her visionary entrepreneurial and technical leadership of the One Laptop Per Child program to develop a rugged, low-cost educational computer for developing countries; the President's Citation to Mel Sahyun (retired) for his more than 15 year editorship of JIST; and the Itek Award to Hector Santos-Villalobos (Oak Ridge National Laboratories) for best student publication in an IS&T journal for the preceding year. Choon-Woo Kim (Inha University, Korea) was honored for his four years of service on the IS&T Board as a Vice President.

## EI 2013

In February 2013, EI will be held in its current location near the San Francisco airport. In 2014, EI moves to downtown San Francisco. EI 2013 Symposium Chairs are Gaurav Sharma (University of Rochester) and Sergio Goma (Qualcomm).

The technical tracks of the Symposium have been expanded to embrace seven areas:

- 3D Imaging, Interaction, and Metrology
- Visualization, Perception, and Color
- Image Processing
- Image Capture
- Computer Vision
- Media Processing and Communication; and
- Mobile Imaging.

There will be three new conferences:

- Mobile Computational Photography;
- Video Surveillance and Transportation Imaging; and
- Mobile Imaging System Design and Image Quality.

Go to http://electronicimaging.org for more information. We hope to see you there! ▲

## SD&A 2012
### by Vivian Walworth

The Conference on Stereoscopic Displays and Applications (SD&A) contributed substantially to this year's EI symposium, with two Keynote addresses and a record number of papers and posters, in addition to the popular SD&A 3D Theater, which featured examples of 3D productions worldwide. The evening demo session, which included exhibits by attendees at several other EI conferences, as well as SD&A, was also well attended. Rather than describing content of individual contributions, we call attention to two articles about this year's SD&A Conference.

Conference co-chair Gregg Favalora provided a comprehensive review of technical content in a May 3D Roundabout <http://3droundabout.com/2012/5/7158/conference-roundup-stereoscopic>. Also the National Stereoscopic Association's March-April issue of *Stereo World* published an excellent account of the conference by long-time 3D expert Ray Zone.

In addition to these articles, a collection of photographs taken by several participants during the SD&A Conference and the Demo Session has been posted at stereoscopic.org. The same site provides links to video recordings of many of the presentations made during the conference.

For readers whose interest may be whetted by all of this 3D news, we should report that the next SD&A Conference will take place as part of the 2013 EI Symposium, February 3-7, at the Hyatt Regency San Francisco Airport.

better colors than the long-short images. Quantitatively, the fused image shows improvement in SNR over the shortest exposed image and the sharpness (obtained by blur metric) over the longest exposed image.

To summarize our method, we use a single pass sigmoidal boosting on the shorter exposed images implemented as LUT, unlike other published methods which require two or more passes. Reuse of edge detection which is a part of JPEG for removal of artifacts further optimizes the algorithm. Lastly, the method requires no more than a single macro block to be kept in memory, because the image fusion is performed essentially in the JPEG file and rendered only on decoding the image.

### Visualization and Data Analysis 2012
### Best Paper Awards
Sponsored by US Department of Homeland Security
National Visualization and Analytics Center (NVAC)

The following papers were presented:

- Integrating sentiment analysis and term associations with geo-temporal visualizations on customer feedback streams *Ming Hao[1], Christian Rohrdantz[2], Halldór Janetzko[2], Daniel Keim[2], Umeshwar Dayal[1], Lars-Erik Haug[1], and Mei-Chun Hsu[1]; [1]Hewlett Packard Labs (USA) and [2]University of Konstanz (Germany)*

- A self-adaptive technique for visualizing geospatial data in 3D with minimum occlusion, *Abon Chaudhuri and Han-Wei Shen, The Ohio State University (USA)*
- Interactive data-centric viewpoint selection, *Han Suk Kim, Didem Unat, Scott B. Baden, and Jürgen P. Schulze; University of California San Diego (USA)*
- Visualization of mappings between the gene ontology and cluster trees, *Ilir Jusufi, Andreas Kerren, and Vladyslav Aleksakhin, Linnaeus University (Sweden); and Falk Schreiber, IPK Gatersleben and Martin-Luther University Halle-Wittenberg (Germany)*
- Instant visitation maps for interactive visualization of uncertain particle trajectories, *Kai Burger[1], Roland Fraedrich[1], Dorit Merhof[2], and Rudiger Westermann[1]; [1]Technische Universität München and [2]University of Konstanz (Germany)*
- Animating streamlines with repeated asymmetric patterns for steady flow visualization, *Chih-Kuo Yeh[1], Zhanping Liu[2], and Tong-Yee Lee[1]; [1]National Cheng-Kung University (Taiwan), [2]University of Pennsylvania and Kentucky State University (USA)*
- Incremental visual text analytics of news story development, *Miloš Krstajić, Mohammad Najm-Araghi, Florian Mansmann and Daniel A. Keim. University of Konstanz (Germany)*
- Designing a better weather display, *Colin Ware and Matthew Plumlee, University of New Hampshire (USA)*

# CGIV2012: A Convergence of Common Interests Under the Banner of Colour

*By C. Alejandro Parraga*



CGIV 2012 attendees gather for a group photo before enjoying dinner in the exquisite Marble Hall of the Royal Tropical Institute.

From the 6th to the 9th of May 2012, an enthusiastic group of 111 specialists from industry and academia met at the 6th European Conference on Colour in Graphics, Imaging, and Vision (CGIV 2012) in Amsterdam, the Netherlands. The meeting was sponsored by IS&T in cooperation with the University of Amsterdam and organized by General Chair Theo Gevers (University of Amsterdam) and Programme Chairs David H. Foster (University of Manchester) and Alessandro Rizzi (Università Degli Studi di Milano). Marcel Lucassen (University of Amsterdam) acted as Short Course Chair and Coordinating Chair.

## Preliminary Activities: Short Courses and Workshops

CGIV 2012 began on Sunday the 6th at the Science Park (Amsterdam University) with two short courses: "General-purpose Gamut Mapping" by Roger Hersch and Romain Rossier (EPFL) and "Understanding and Handling the Quality of Experience (QoE) for Multimedia Applications" by Mohamed-Chaker Larabi (Univ. of Poitiers).

"General-purpose Gamut Mapping" and was divided into three short presentations followed by laboratory exercises. The presentations gave the audience a chance to grasp the concepts of color management, print prediction models, and gamut mapping. In the lab portion of the class, participants created visualizations of sRGB and CMYK gamuts using a set of Matlab functions provided by the instructors and tested the effects of different gamut mapping parameters on a display preview. Chaker Larabi's class centered on the very important issue of quality assessment in the framework of image and video processing. The meaning of QoE for multimedia applications was discussed alongside methods for measuring it. Several practical examples of how to best handle quality assessment were also addressed.

Both courses were intended for scientists, engineers, managers, and marketing personnel, showing the variety of interests of the audience. Indeed one of the strengths of CGIV is the inclusiveness and the breath of its program, which makes it attractive for specialists and students from both academia and industry under a common interest in color.

## The Venue

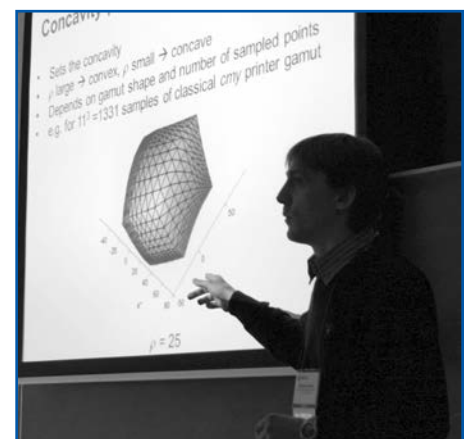All oral and interacive (poster) sessions were held in the Auditorium (Oude Lutherse Kerk), a beautiful 17th-century

Romain Rossier discusses gamut mapping during one of the Sunday short courses.

church belonging to the University, located in the historic and commercial center of Amsterdam. Although still functioning as a church, this historic building is the formal venue where modern PhD viva ceremonies are held throughout the academic year. As in previous occasions, this year's CGIV

Left: General Chair Theo Gevers opening CGIV2012. Below: Olde Lutherse Kerke auditorium. Right: IS&T Vice President Geoff Woolfe preseing the IS&T Journal Award to Oyvind Kolas, Ivar Farup, and Alessandro Rizzi. Far right: Coordinating and Short Course Chair Marcel Lucassen.
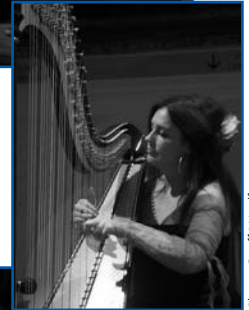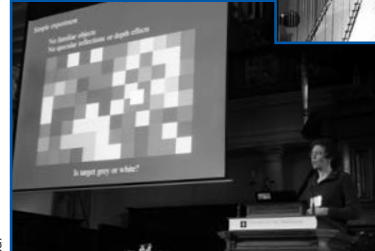
Above: Chakar Larabi wearing the honorary orange cowboy hat of the Session Chair.

Right: CIMET at CGIV.

Two above: The Conference Dinner offered an elegent venue in which to network, while serenaded by harp music (upper right). Directly above: Eli Brenner presents his work at CGIV 2012.

proved to be truly international, with participants arriving from 24 different countries (mostly within Europe, but also including Iran, Japan, the US, and Canada. Both the international presence and the scope of the program confirm the persistent interest in color science which extends well into industry, science, research, education, and marketing. In fact it is at conferences like CGIV where cooperation is fostered by creating networks of people with similar interests, although with different backgrounds and occupations. This is done though learning from each other during the scientific sessions, but also during the social events, where attendants have a chance to exchange viewpoints and seek out exciting new collaborations across the globe.

There is also an overall network of societies that cooperate actively to make events like CGIV2012 possible. This year the support came from The Colour Group (Great Britain), the Comité Español del Colour, the Deutsche Gesellschaft für Angewandte Optik, DGaO, the Flemish Innovation Centre for Graphic Communications VIGC, the French Color Imaging Group, the German Society for Color Science and Application (DfwG), the GI Fachbereich Graphische Datenverarbeitung, the Gruppo del Colore (Italian Color Group), the Inter-Society Color Council, The Royal Photographic Society of Great Britain/ Imaging Science Group, and the Swedish Colour Centre Foundation.

## Technical Program

There were 66 papers presented at CGIV 2012, and each one was subject to review by two experts before being accepted for the technical program. The acceptance rate was 86% and successful papers were divided into 38 oral and 30 interactive presentations before being added to the conference proceedings and conference website at www.imaging.org. The program encompassed areas such as Colour Capture and Reproduction, Image Quality, Colour Appearance, and Video Processing. The topics of individual presentations were balanced between the academic and industrial worlds. Popular subjects were colour vision and colour appearance, chromatic reproduction applied to textiles and paints, color psychophysics and visual deficiencies, machine learning algorithms applied to various color problems, color image processing and color analysis, and image and video processing among others. These interests were also reflected in the three keynote talks: "Example-based image manipulation," Erik Reinhard (Max-Planck-Institute for Informatics); "Are a priori metrics in colorimetry meaningful?," Jan Koenderink (KU Leuven and Delft University of Technology); and "What makes a good picture? Reflections on image quality research," Geoff Woolfe (Canon Australia).

Near the end of the conference, all
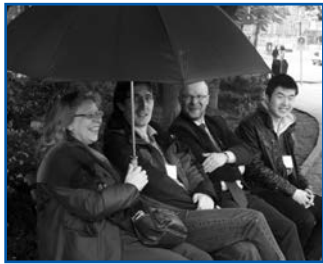
participants voted for the best interactive presentations. "Colour appearance modelling between physical samples and their representation on large liquid crystal display" (Chrysiida Kitsara et al) and "Skin chromaticity gamuts for illumination recovery" (Stuart O.J. Crichton et al) were selected. The Conference Committee also presented best paper awards to "Metamer mismatch volumes" (Alexander Logvinenko et al) and "Spatio-temporal retinex-like envelope with total variation" (Gabriele Simone and Ivar Farup).

## Social Activities

The social program highlighted the quality of the venue city, with a welcome reception, a boat trip through the large network of city canals, and banquet. The grand Krasnapolsky Hotel, located at the edge of Dam Square, in Amsterdam's historical center played host to Welcome Reception was inside on Sunday night. On Monday evening, participants enjoyed the tranquillity of Amsterdam's 17th century canals via a guided boat trip through the city's historic districts. The Conference Banquet took place at the beautiful Royal Tropical Institute, whose history dates from 1864, when it began as the Colonial Museum, housing a collections of artefacts brought back from the Dutch colonies in the East. Conference participants enjoyed dinner at the stunning Marble Hall, accompanied by pleasant and relaxing harp music. Overall, the venue provided a large selection of cultural attractions, ranging from the Rijksmuseum, Van Gogh, and Hermitage Amsterdam museums, to the Anne Frank and Rembrandt Houses. Some participants also enjoyed the annual Keukenhof springtime tulip festival.

## The Conference Experience

On a more personal level, I enjoyed CGIV2012 because of its particular mixture of approaches to the subject of color, from the state-of-the-art, problem-solving engineering approaches to the more curiosity-driven scientific approach and the business-investment side. In particular, the Amsterdam conference gave me and my colleagues a calm, relaxed opportunity to learn, meet old friends, make new acquaintances and further our professional careers, while enjoying one of the most exiting cities of the world.

As of now, CGIV2014 is scheduled to take place in Milan, Italy—another inspirational destination. Stay tuned for more information on that event! ▲

Photo courtesy of Francisco Imai.

Above: Shoji Tominaga, Javier Hernandez, Nicolas Bonnier, and Francisco Imai on the boat Tour.

Left: The canal tour was a highlight of the conference social program.

Photo: Marcel Lucassen.