IN HIGHLIGHTED PAPERS: NIP27/DIGITAL FABRICATION 2011

Winner of the Best Interactive Paper

Direct Printing of Circuit Boards Using Aerosol Jet®

Kurt K. Christenson, Jason A. Paulsen, Michael J. Renn, Kelley McDonald, and Justin Bourassa, Optomec (USA)

Abstract: Printed Circuit boards (PCBs) are traditionally fabricated using subtractive technologies such as lithography and etching. Discrete passive and active components are typically attached by pick and place and then connected using wire bonding and soldering. In this paper we show that direct printing can replace many of the traditional steps and consequently allow circuits to be fabricated on novel substrates and 3D geometries. Specifically, we report on the integration of Aerosol Jet® with the printing of interconnects, passives and COTS attachment. The automated generation of the printed patterns (tool paths) is based on standard Eagle CAD PCB layout software. Multilayer circuits are fabricated by alternately printing metallic wires and a polymeric insulator. Passive components such as resistors and capacitors are printed from a library. The carbon-based resistors have a range of 50 Ω to 1 MΩ and the parallel plate capacitors range from 1 pF to 1 nF. Active devices can be incorporated into the circuit by attaching discrete IC chips with metallic and adhesive inks. The processing temperature is below 150°C for all the printing and curing steps. Overall, Aerosol Jet® is a cost effective method for directly printing circuits onto non-traditional substrates and is also desirable for prototyping and short-run manufacturing.

Paper vs. Electronic Media: Work Efficiency and Environmental Impact

Hirohito Shibata; Fuji Xerox Co., Ltd. (Japan)

Abstract: This presentation quantitatively compares paper and electronic media from the perspectives of CO2 emissions and work efficiency. Should we reject paper out of hand based on environmental considerations? Can electronic reading devices replace paper books for leisure and work? I discuss these issues based on various analyses and experiments.

Development of Conductive Carbon Coated Copper Nanoparticle Inkjet Fluid

Kim Eiroma, Ari Auvinen, Johanna Forsman, Eva-Lena Hult, Jorma Jokiniemi, Pirjo Koskela, Juha Sarlin, Thea Sipiläinen-Malm, and Unto Tapper, VTT Technical Research Centre of Finland (Finland)

Abstract: An aqueous inkjettable conductive fluid based on carbon coated copper nanoparticles has been developed. The fluid can be handled in atmospheric conditions and processed at low temperature (105°C) with no thermal annealing. A layer conductivity exceeding 600 S/cm has been demonstrated. The particles were produced in a continuous flow reactor from copper chloride powder by hydrogen reduction at high temperature (950°C). Results indicate...
cate that conductivity is enhanced through the formation of carbon nanotubes by addition of ethene and water to the reaction flow. The type and concentration of dispersing additive and co-solvents had a significant impact on dispersion stability and electrical conductivity of the deposited layer. Applicability of the fluid for direct patterning of coatings for e.g. antistatic purposes was demonstrated by inkjet printing of a conductor electrode pattern.

Full Color Reflective Electronic Media

Qin Liu1, Zhang-Lin Zhou2, Brad Benson1, Gregg Combs1, Jong-Souk Yeo1, Jeff Mabeck1, Tim Koch1, and Dick Henze2;
1Hewlett Packard Company (USA), 2Hewlett Packard Laboratories (USA), and 3Yonsei University (Korea)

Abstract: Just as HP is leading the transition to individually tailored content consumption for printed media with variable data printing from its digital presses, it is also actively pursuing full-color reflective display technologies as an electronic media in support of low-power applications for digital content consumption. A great challenge in realizing the potential of reflective electronic media is achieving vivid full colors that match or exceed the color gamut described by printing standards such as the Specifications for Newsprint Advertising Production (SNAP). Based on the principles of color printing, a stacked device design using a novel electrokinetic architecture has been proposed that offers the potential for achieving or exceeding SNAP’s color gamut.

Printable Biodegradable Hydrogel with Self-Crosslinking Agents for Wound Dressings

Maria Yanez1, Carmelo De Maria2, Julio Rincon1, and Thomas Boland3;
1University of Texas at El Paso (USA) and 2The University of Pisa (Italy)

Abstract: The printed Biomaterial Laboratory at UTEP does research a printable hydrogel, which can have appropriate properties for tissue engineering of the skin. Skin is the largest organ in our body which protects us from the environment and pathogens. Skin can be affected by burns and also by diabetic foot ulcers. The current tissue engineered skin substitutes for treatment of diabetic foot ulcers have many shortcomings including difficulty of handling, little if any host integration and not being customizable. The goal of this research is to create a wound care material, that helps by integrating with the host tissue. We have been investigating a biodegradable hydrogel which is derived from natural proteins and carbohydrates creating a scaffold to use as a substrate to grow cells. The main components of this hydrogel are gelatin and alginate, both materials with very high biocompatibility and promoting cell proliferation and vascularization. Here we have been studying the oxidation of sodium alginate to generate aldehyde groups that can crosslink the amino group of gelatin and form the biodegradable hydrogel. We also have been investigating the viscosity, gelling time and degree of crosslinking of alginate as a function of pH, degree of oxidation, concentration and temperature. Viscosities for 10% alginate solutions in the range of 5-10 cp are obtained, making this material printable. For printable testing we modified an inkjet printer to control the temperature of the cartridge and of the deposition plate. In general, control over the concentrations of alginate as well as the spatial dispensing via printing in a temperature-controlled environment should allow us to generate wound dressings of tunable properties. For future work we will include testing viscosity and printability of alginate adding different types of cells, as fibroblast, keratinocytes and endothelial cell, varying cell concentration. We will also include testing the wound dressing in a small animal model on healing and wound contraction.

Please send inquiries to: info@imaging.org
©2011 Society for Imaging Science and Technology. All rights reserved.
During the first week of October, NIP27/Digital Fabrication 2011 was held in Minneapolis, Minnesota. For someone like me, from southern Europe, I was expecting cold weather, freezing winds, and trees without leaves. But it was just the opposite. We had wonderful, sunny, warm weather and trees filled with leaves of orange, red, and gold—the perfect atmosphere for lunchtime walks and outdoor networking.

The bulk of this year’s short courses occurred on Sunday and Monday, with quite a good level of attendance and a few new courses such as Introduction to 3D Printing, Free Volume Effects in Imaging Systems, Digital Packaging, Overview and Segmentation of Digital Production Printing, and Innovation Processes, an Oxymoron?

This year we had a couple of key themes we wanted to reinforce. One was digital printing workflows, a relevant piece of technology required to move analog printing to digital. To augment technical talks on this topic, we featured two keynote speakers who covered this area: Shane Kenyon (Xerox Corporation) guided us through the myriad of technologies and solutions required for managed print services, an area expected to grow considerably in the next years. Will Allen (Hewlett-Packard Company) was more controversial in a way, showing how digitalization of technology typically pushes the market growth to different frontiers, far away from core technologies. I found his talk quite awakening.

A third keynote speaker, Hirohito Shibata from Fuji Xerox, covered the other theme in the conference, environmental sustainability, with a fairly controversial presentation around quantitative research comparing paper and electronic media from CO2 impact and work efficiency perspectives. I could tell that this paper created many heated discussions during coffee breaks!

This year we had a few new sessions in the conference that I believed enhanced the coverage. One was printing services and solutions; another mathematical modeling of printing and related processes. The latter was very successful, with high levels of attendance and interest. I think it would be a great session to keep in the future.

The strong Inkjet Printing sessions (processes and materials) spanned three days, with more than 25 oral papers presented, half of them from universities and research centers. This is an indication of the level of interest of this basic technology, not just for traditional printing, but for digital fabrication applications as well.

Another of the standard sessions—at NIP since the first conference in Venice—toner-based printing processes and materials spanned a whole day.

The session on commercial printing and digital packaging covered a wide range of applications including ceramic, packaging, and textile printing.

The Printing Systems Engineering and Optimization session was quite crowded this year with interesting papers covering print quality optimization systems spanning dry and liquid electro photography, inkjet, toner manufacturing processes, drop detection systems, paper control (wrinkles and advance) and system calibration methods. The topic of environmental sustainability widened its coverage from last year to include life cycle and carbon footprint analysis, deinking technologies, certification and new environmental impact measurement processes.

One session consolidated from the last NIP conference is security and forensic printing, which covered a very different aspects of providing safety and authentication methods to printed materials, a growing field in the path from analog to digital.

The conference sessions were completed with color science and image processing, electronic paper, image permanence, photo-electronic imaging materials and thermal printing, all of them showing attractive novelties from companies and research centers.

I felt that the Innovation Panel event was quite energetic and engaging, with George Gibson (Xerox Corporation) actively asking controversial questions as moderator, and Ramon Borrell (Xaar), Eric Hanson (HP Labs), and Jack Gormley (Sun Chemical) sharing with the group their views on how to improve innovation in their development processes.

The other special event held this year was a set of stimulating and exciting simultaneous roundtables where small groups of people shared their views on the limits of ink jet printing, nanotechnology in non-impact printing, best practices for university/industry collaboration.

The conference exhibit featured 38 companies who shared their new products and offered opportunities to partner. The space was shared with the interactive posters, print sample gallery, and demonstration session where each author had the opportunity to explain their research in more depth to the conference attendees. Having these two activities share the same space helped in fostering networking.

The conference reception venue was exceptional this year.

To enjoy dinner while chatting...
Influence of Printhead Geometry, Print Conditions and Fluid Dynamic Properties on the Jetting Behaviour

Tri Tuladhar, John Tatum and Paul Drury; Xaar plc (UK)

Abstract: This paper investigates key dynamic properties of the ink, at the timescale relevant to the inkjet printing, that can differentiate between good and bad inks which otherwise looked identical. An “Ink fluid map” is created for specific printhead which take account of the printhead geometry, jetting conditions and ink’s bulk and key dynamic properties. This paper presents case studies whereby the “ink fluid map” is utilized to (i) identify optimum printhead geometry and print conditions (velocity, print frequency and temperature) for a given ink; (ii) formulate/recommend ink that meets both bulk and dynamic properties for reduced misting, satellite formation and improved reliability.

Inkjet Printing of Isolation Layers for Back-Contacted Silicon-Heterojunction Solar Cells

Ingo Reinhold1, Nicola Mingirulli2, Jan Haschke2, Wolfgang Voir1, Bernd Rech2, and Werner Zapka1; 1XaarJet AB (Sweden) and 2Helmholtz-Zentrum Berlin Institute of Silicon Photovoltaics (Germany)

Abstract: For wafer based silicon solar cells, the combination of amorphous/crystalline silicon (a-Si:H/c-Si) heterojunction emitters (SHJ) and back-contacted back-junction solar cell concepts (BCBJ) offer a very high efficiency potential of around 24%. Stangl et al. proposed a relatively simple and therefore attractive cell concept comprising a two level metallization isolated by an insulating layer. The emitter layer consisting of doped amorphous silicon with a thickness of several nm and the emitter metallization layer comprise circular openings where the back surface field layers and the respective metallization establish contact to the absorber.

In this work the potential of inkjet printing for the deposition of the isolation layer with photoresists or other polymeric fluids is evaluated. Challenges are the required placement precision and the feature size. In order to produce circular openings of the order 10 μm, the drop formation has to be optimized, and the ink spreading on both surfaces—on the aluminum emitter and on the silicon wafer substrate—have to be controlled.

Toner Charge and Environmental Interactions with Toner Adhesion

Julie G. Whitney; Lexmark International (USA)

Abstract: Understanding charged particle adhesion forces is a critical step in the understanding and modeling of electrophotographic printing processes. Electrostatic and mechanical (Van der Waals) forces are both significant contributors to toner adhesion to substrates, and previous work has shown these to have roughly equivalent magnitudes in modern printer designs. Measuring distributions of toner adhesion as a function of multiple parameters including environmental and toner charge variation has revealed that there are additional interactions beyond Coulombic Attraction and dipole induced London-Van der Waals’ forces which are significant contributors to system performance. A model for toner adhesion is presented, including a term which describes the increased adhesion resulting from particle deformation at higher temperatures. Experimental results show good correlation to the model.

Edible 3D Printing

Deborah Southerland, Peter Walters, and David Huson, University of the West of England (UK)

Abstract: The potential of 3D printing has been under technical and philosophical discussion for some time, but current rapid prototyping materials can be costly and are limited in terms of functional and visual qualities. Food-based materials could provide a novel and exciting alternative which may also be affordable and accessible as 3D printing extends from industrial applications towards educational and home use.

This paper will compare and contrast the findings of a research project that explores freeform fabrication of food-based materials using rapid prototyping techniques. The three techniques are:

- Rapid tooling: Using conventional Z-Corp powder binder 3D printing to fabricate master models from which silicon moulds are made and food materials cast.
- Powder / binder 3D printing using a combination of different sugars to produce edible forms.
- Extrusion based rapid manufacture using materials that include potato, chocolate and cream cheese.

The investigation of food as a material used in conjunction with these technologies is a growing
SPECIAL PULL-OUT SUPPLEMENT TO THE REPORTER

JIST AND JEI: 2011 IN REVIEW

For your reference, a complete listing of all of the papers published in JIST and JEI in 2011.

JIST Vol. 55, No. 1 January/February 2011

Editorial Material
010101 From the Editor, M. R. V. Sahyun

Feature Article
010201 Imbibition and Evaporation of Water Droplets on Paper and Solid Substrates, A. Oko, A. Swerin, and P. M. Claesson

General Papers
010501 A New Method to Assess the Jetting Behavior of Drop-on-Demand Ink Jet Fluids, Sungjune Jung, Stephen D. Hoath, Graham D. Martin, and Ian M. Hutchings
010503 Computational Lighting Reproduction for Facial Live Video with Rigid Facial Motion, Takao Makino, Koichi Takase, Keiichi Ochiai, Norimichi Tsumura, Toshiya Nakaguchi, and Nobutoshi Ojima
010504 Hue Preservation using Enhanced Integrated Multiscale Retinex for Improved Color Correction, Wang-Jun Kyung, Tae-Hyoung Lee, Cheol-Hee Lee, and Yeong-Ho Ha
010505 Improved Color Separation Based on Dot-Visibility Modeling and Color Mixing Rule for Six-Color Printers, Chang-Hwan Son, Hyung-Min Park, and Yeong-Ho Ha
010506 Efficient Generation of Holographic Video of Three-Dimensional Objects using Spatio-Temporal Redundancy of Three-Dimensional Video Imagery and Novel Look-Up Table Methods, Sun-Hee Kim, Hong-Chul Lee, and Seung-Cheol Kim
010507 Performance Metrics for Passive Auto-Focus Search Algorithms in Digital and Smart-Phone Cameras, Mark Gamadia, Mohammad T. Rahman, and Nasser Kehtarnavaz
010509 Control of the Morphology of Dispersed Crystalline Polyester in a Toner for Low-Energy Fusing, Norihiro Fukuri, Eiji Shirai, Shigeto Inoue, Masayuki Okamoto, and Katsutoshi Aok

JIST Vol. 55, No. 2 March/April 2011

Editorial Material
020101 From the Editor, M. R. V. Sahyun
020102 Letter to the Editor Comments on “Life-Size Reproduction of the Shroud of Turin and Its Image” by L. Garlaschelli, Giulio Fanti and Thibault Heimburger
020103 In Memoriam—Robert Gundlach, Mel Sahyun

Feature Article
020201 Optimum Optical Conditions for Fluorescence Imaging Using a Confocal Laser Scanning Microscope to Determine Three-Dimensional Shape of Ink Jet Dots on Paper, Toshiharu Enomae, Akira Isogai, Mikiko Naito, Yasushi Ozaki, and Hisato Nagashima

General Papers
020501 Effect of Different Coating Amounts on the Surface Roughness and Print Gloss of Screen Coated Offset Prints, Igor Karlović and Dragoljub Novaković
020503 Control Characteristics of Toner Beam by Pulsed Voltage Applied to a Pair of Aperture Electrodes, Kai Li and Yasushi Hoshino
020504 Four Different Crystals Derived from a Novel Yellow Pyrazolyl Azo Pigment, Hiroki Shibata and Jin Mizuguchi
020505 Electronic Structure of 4,6-bis[5-amino-3-tert-butyl-4-[(3-methyl-1,2,4-thiadiazol-5-yl)diazeneyl]-1H-pyrazol-1-yl]-1,3,5-triazin-2(1H)-one of the trans Form Used for Yellow Ink Jet Inks, Hiroki Shibata and Jin Mizuguchi
020507 Color Correction Using a Still Camera for Images Projected onto a Light Colored Screen, Dae-Chul Kim, Tae-Hyoung Lee, Ho-Gun Ha, and Yeong-Ho Ha
020508 An Adult Image Identification System Based on Robust Skin Segmentation, Seok-Woo Jang, Young-Jae Park, Gye-Young Kim, Hyung-II Choi, and Min-Chel Hong
020509 Defining Semantic Structure Features for Content-Based Visual Object Class Recognition, Nishat Ahmad and Jongan Park
020510 Hologram Recording Using Photothermographic Materials, Ken’ichi Kuge, Hironobu Mori, and Tomoko Sakai
JIST Vol. 55, No. 3 May/June 2011

Editorial Material
030101 From the Editor, M. R. V. Sahyun

Feature Article
030201 Skin Color Modeling of Digital Photographic Images, Huanzhao Zeng and M. Ronnier Luo

General Papers
030501 Color Embedding and Recovery Using Wavelet Packet Transform with Pseudorandomized Saturation Code, Kyung-Woo Ko, Dae-Chul Kim, Wang-Jun Kyung, and Yeong-Ho Ha
030502 Integrated Method for Three-Dimensional Shape and Multispectral Color Measurement, Grzegorz Mączkowski, Jakub Krzeslowski, and Robert Sitnik
030503 Digital Image Improvement by Adding Noise: An Example by a Professional Photographer, Takehito Kurihara, Yoshitsugu Manabe, Naokazu Aoki, and Hiroyuki Kobayashi
030504 Analysis of Sharpness Increase by Image Noise, Takehito Kurihara, Naokazu Aoki, and Hiroyuki Kobayashi
030505 Effect of Scene Content on the Perceptibility of Differential Gloss, Susan P. Farnand
030506 Evanescent Wave Based System for Observing Particle-Substrate-Charge Interactions, Henryk Birecki and Thomas C. Anthony
030508 Azo or Hydrazone Structure in Some Hydrogen-Bonded Azo Pigments, Yuya Kamei, Hiroki Shibata, and Jin Mizuguchi
030509 Spectral Imaging of the Human Retina and Computationally Determined Optimal Illuminants for Diabetic Retinopathy Lesion Detection, Pauli Fält, Jouni Hiltunen, Markku Hauta-Kasari, Iiris Sorri, Valentina Kaleyskiene, Juhani Pietilä, and Hannu Uusitalo

Don’t disrupt your access to proceedings and journal articles, the member database, or conference discounts . . . RENEW YOUR MEMBERSHIP TODAY!

JIST Vol. 55, No. 4 July/August 2011

Editorial Material
040101 From the Guest Editors, James W. Stasiak, Ross N. Mills, and Reinhard R. Baumann

Feature Article
040201 Gravure Printed Ultrathin Layers of Small-Molecule Semiconductors on Glass, Nils Bornemann, Hans Martin Sauer, and Edgar Dörsam

Special Section: Functional Printing and Digital Fabrication
040301 Ink Jet Technology for Large Area Organic Light-Emitting Diode and Organic Photovoltaic Applications, Maosheng Ren, Harrie Gorter, Jasper Michels, and Ronn Andriessen
040302 Ink Jet Printed Silver Lines Formed in Microchannels Exhibit Lower Resistance Than Their Unstructured Counterparts, Ute Löffelmann, Jan G. Korvink, Chris E. Hendriks, Ulrich S. Schubert, and Patrick J. Smith
040303 Fabrication of Metal Electrodes Based on the Self-Differentiation Technique Using the Novel High-and-Low Strategy, Dong-Youn Shin
040305 Experimental Study of the Influence of Nozzle Defects on Drop-on-Demand Ink Jets, José Rafael Castrejón-Pita, Graham D. Martin, and Ian M. Hutchings
040306 Electrophotography—An Efficient Technology for Biochip Fabrication, Stefan Gütter, Simina Fulga, Andrzej Grzesiak, Oliver Reile, Ralf Bischof, Frank Breitling, and Volker Stadler

General Papers
040501 Characterization of Total Dot Gain by Microscopic Image Analysis, Mahziar Namedanian and Sasan Gooran
040502 Local Contrast Enhancement Based on Adaptive Multiscale Retinex Using Intensity Distribution of Input Image, In-Su Jang, Tae-Hyoung Lee, Wang-Jun Kyung, and Yeong-Ho Ha
040503 Spatio-Temporal Retinex-Inspired Envelope with Stochastic Sampling: A Framework for Spatial Color Algorithms, Øyvind Kolås, Ivar Farup, and Alessandro Rizzi
040504 Preferred Skin Color Reproduction Based on Y-Dependent Gaussian Modeling of Skin Color, Sung-Jin Kang, Oh-Yeol Kwon, and Sung-Il Chien
From the Editor, M. R. V. Sahyun

Feature Article

Segment-Based Real Time Stereo Vision Matching Using Characteristic Vectors, Pablo Revuelta Sanz, Belén Ruiz Mezcua, José M. Sánchez Pena, and Jean-Philippe Thiran

Use of Light-Emitting Diodes in Multispectral Systems Design: Variability of Spectral Power Distribution According to Angle and Time of Usage, Óscar Martínez,Meritxell Vilaseca, Montserrat Arjona, Carles Pizarro, and Jaume Pujol

Lossless Data Hiding for JPEG Pictures, Yih-Chuan Lin and Tzung-Shian Li

Impact of Scrambling on Barcode Entropy, Marie Vans and Steven J. Simske

Effect of Scanner Resolution and Character Selection on Source Printer Identification, Jason S. Aronoff and Steven J. Simske

Dependence of Rewritable Characteristics on Dye and TiO₂ Concentrations in Wax-Based Electrophoretic Thin Media, Takeshi Hasegawa and Yasushi Hoshino

Toner Charge Control With Externally Added Charge Control Agent Particles, Koichi Tsunemi,

UPCOMING IS&T EVENTS

January 8-9, 2012; Las Vegas, Nevada
International Symposium on Technologies for Digital Photo Fulfillment
Symposium Chair: Stuart Gordon

January 22-26, 2012; San Francisco Airport Hyatt Regency
Electronic Imaging 2012
Symposium Chairs: Majid Rabanni and Gaurav Sharma

May 6-9, 2012; Amsterdam, the Netherlands
CGV 2012
General Chair: Theo Gevers

June 12-15, 2012; Copenhagen, Denmark
Archiving 2012
General Chairs: Mogens Koch and Jonas Palm

September 9-13, 2012; Quebec City, Canada
General Chairs: Scott Silence (NIP28) and Paul Benning (DF2012)

November 12-16, 2012; Los Angeles, California
Twentieth Color Imaging Conference (CIC20)
General Chairs: Stephen Westland and Xuemei Zhang

To learn about all upcoming IS&T meetings, go to www.imaging.org/ist/Conferences/.
For a complete list of imaging-related meetings, go to www.imaging.org/ist/conferences/events.cfm
**JEI January - March 2011, Volume 20, Issue 1**

**JEI Letters**

010501 *On the security of ownership watermarking of digital images based on singular value decomposition*, Huo-Chong Ling, Raphael C.-W. Phan, and Swee-Huat Heng

010502 *Colorization based on soft segmentation*, Hyung-II Koo and Nam-Ik Cho

**Regular Articles**

013001 *High capacity reversible watermarking using differential histogram shifting and predicted error compensation*, Dong-Gyu Yeo, Hae-Yeoun Lee, and Byeong Man Kim

013002 *Calibrating light sources by using a planar mirror*, Hui-Liang Shen and Yue Cheng

013003 *Genetic algorithm for clustering mixed-type data*, Shiueng-Bien Yang and Yung-Gi Wu

013004 *Implementation of a cellular neural network—based segmentation algorithm on the bio-inspired vision system*, Fethullah Karabiber, Giuseppe Grassi, Pietro Vecchio, Sabri Arik, and M. Erhan Yalcin

013005 *Dark current in an active pixel complementary metal-oxide-semiconductor sensor*, Justin C. Dunlap, William C. Porter, Erik Bodegom, and Ralf Widenhorn

013006 *Photometric approach to surface reconstruction of artistic paintings*, Takayuki Hasegawa, Norimichi Tsumura, Toshiya Nakaguchi, and Koichi Iino

013007 *Using image entropy maximum for auto exposure*, Mohammad T. Rahman, Nasser Kehtarnavaz, and Qolamreza R. Razlighi

013008 *Halftone moiré due to imager distortion*, Orhan Bulan, Robert Loce, and Beilei Xu

013009 *Image segmentation by optimizing a homogeneity measure in a variational framework*, Wei Wang and Ronald Chung

013010 *Automatic visual inspection and defect detection on variable data prints*, Marie Vans, Sagi Schein, Carl Staelin, Pavel Kislev, Steven Simske, Ram Dagan, and Shlomo Harush

013011 *Main subject detection via adaptive feature refinement*, Cuong Vu and Damon Chandler

013012 *Enhancement of the asymmetry-based overlapping analysis through features extraction*, Naima Kaabouch, Yi Chen, Wen-Chen Hu, Julie W. Anderson, Forrest Ames, and Rolf Paulson

013013 *Improving identification accuracy on low resolution and poor quality iris images using an artificial neural network—based matching metric*, Randy P. Broussard and Robert W. Ives

013014 *Comprehensive scheme for subpixel variable block-size motion estimation*, Ying Zhang, Wan-Chi Siu, and Tingzhi Shen

013015 *Case for a field-programmable gate array multicore hybrid machine for an image-processing application*, Ryan N. Rakvic, Robert W. Ives, Javier Lira, and Carlos Molina

**JEI April - June 2011, Volume 20, Issue 2**

**Regular Articles**

023001 *Color harmonization for images*, Zhen Tang, Zhenjiang Miao, Yanli Wan, and Zhifei Wang

023002 *Accurate three-dimensional registration of magnetic resonance images for detecting local changes in cartilage thickness*, Yuanzhi Cheng, Quan Jin, Jie Zhao, Changyong Guo, and Jie Bai

023003 *Lossless and lossy coding for multispectral image based on SRGB standard and residual components*, Kazuma Shinoda, Yuri Murakami, Masahiro Yamaguchi, and Nagaaki Ohyama

023004 *Adaptive level-set evolution without initial contours for image segmentation*, Meng Li, Chuanjiang He, and Yi Zhan

023005 *Single-image super-resolution based on Markov random field and contourlet transform*, Wei Wu, Zheng Liu, Wail Gueaieb, and Xiaohai He
Semiautomatic zoom lens calibration based on the camera’s rotation, Juhyun Oh and Kwanghoon Sohn

Low-complexity camera digital signal imaging for video document projection system, Shih-Chang Hsia and Po-Shien Tsai

Image colorization using Bayesian nonlocal inference, Chen Yao, Xiaoakang Yang, Li Chen, and Yi Xu

Color rolling suppression algorithm considering luminance and color constancy, Hyun Mook Oh, Joonyoung Chang, Bong Hyup Kang, and Moon Gi Kang

Error resilient framework using one-pass explicit flexible macroblock ordering map generation and error concealment for H.264/AVC wireless video communication, Jantana Panyavaraporn and Supavadee Aramvith

Efficient chroma subsampling strategy for compressing digital time delay integration mosaic video sequences in H.264/AVC, Kuo-Liang Chung, Wei-Jen Yang, Chyou-Hwa Chen, Hong-Yuan Mark Liao, and Sheng-Mao Zeng

Array set addressing: enabling technology for the efficient processing of hexagonally sampled imagery, Nicholas I. Rummelt and Joseph N. Wilson

Image resolution enhancement via image restoration using neural network, Shuangteng Zhang and Yihong Lu

SCAN secure processor and its biometric capabilities, Raghudeep Kannavara, Sukarno Mertoguno, and Nikolaos Bourbakis

Efficient key frames selection for panorama generation from video, Mohammad Javad Fadaeislam, Mohsen Soryani, and Mahmood Fathy

Color demosaicking by local directional interpolation and nonlocal adaptive thresholding, Lei Zhang, Xiaolin Wu, Antoni Buades, and Xin Li

Blind source separation of images based on general cross correlation of linear operators, Noam Shamir, Zeev Zalevsky, Leonid Yaroslavsky, and Bahram Javidi

Spatiotemporal attention operator using isotropic contrast and regional homogeneity, Roman Palenichka, Ahmed Lakhssassi, and Marek Zaremba

Book Review

Fourier Methods in Imaging, by Roger L. Easton, Jr., Paul J. Kane, Reviewer

JEI July - September 2011, Volume 20, Issue 3

Regular Articles

Fusion of thermal- and visible-band video for abandoned object detection, Cigdem Beyan, Ahmet Yigit, and Alptekin Temizel

Autofocus method using dual aperture and color filters, Kwanghyun Koh, Jung Gap Kuk, Bora Jin, Wooseok Choi, and Nam Ik Cho

Reliable tracking algorithm for multiple reference frame motion estimation, Tsz-Kwan Lee, Yui-Lam Chan, Chang-Hong Fu, and Wan-Chi Siu

Compute-unified device architecture implementation of a block-matching algorithm for multiple graphical processing unit cards, Francesc Massanes, Marie Cadennes, and Jovan G. Brankov

Fast pixel-size-based large-scale enlargement and reduction of image: adaptive combination of bilinear interpolation and discrete cosine transform, Shu-Mei Guo, Chih-Yuan Hsu, Guo-Ching Shih, and Chia-Wei Chen

Residual bulk image quantification and management for a full frame charge coupled device image sensor, Richard Crisp

Novel wavelet-based image interpolations in lifting structures for image resolution enhancement, Shu-Mei Guo, Bo-Wen Lai, Yi-Cheng Chou, and Chin-Chang Yang

Toward a digital camera to rival the human eye, Orit Skorka and Dileepan Joseph

Fast interpolation for line-pruned images, Anh Vu Le, Hye-moon Kim, and Chee Sun Won

Depth adjustment for stereoscopic images and subjective preference evaluation, Donghyun Kim, Sungwhan Choi, and Kwanghoon Sohn

Adaptive image acquisition by autodefocusing, Tao Ma and Stanley J. Reeves

Novel watermarking technique based on the generalized squared interpoint distance for image copyright protection applications, Hazem Munawer Al-Otum and Omar Qasaimeh

Fuzzy similarity measure-based hybrid image filter for color image restoration: multimethodology evolutionary computation, Shu-Mei Guo and Chin-Chang Yang

Image denoising based on adaptive nonlinear diffusion in wavelet domain, Ajay K. Mandava and Emma E. Regentova
**Book Review**


**JEI October - December 2011, Volume 20, Issue 4**

**Regular Articles**

043001  *Improved lossless coding algorithm in H.264/AVC based on hierarchical intra-prediction and coding-mode selection*, Li-Li Wang and Wan-Chi Siu

043002  *Combining wavelets transform and Hu moments with self-organizing maps for medical image categorization*, Leandro A. Silva, Emilio Del-Moral-Hernandez, Ramon A. Moreno, and Sergio S. Furuie

043003  *Dynamic stopping criteria of turbo codes for clustered set partitioning in hierarchical trees encoded image transmission*, Jiunn-Tsair Fang and Cheng-Shong Wu

043004  *Real-time adjustment of transfer function for Fourier volume rendering*, Chang-Chieh Cheng and Yu-Tai Ching

043005  *Pre- and postprocessing for multilayer compression of scanned documents*, Alexandre Zaghetto and Ricardo L. de Queiroz

043006  *Theoretical and experimental comparison of different approaches for color texture classification*, Francesco Bianconi, Richard Harvey, Paul Southam, and Antonio Fernandez


TBA*  *Vehicle detection algorithm based on light pairing and tracking at nighttime*, Weibing Wan, Tao Fang, and Shuguang Li

TBA*  *Moving object detection in the presence of dynamic backgrounds using intensity and textural features*, Pojala Chiranjeevi and Somnath Sengupta

TBA*  *Semiblind copyright protection of color images based on a hybrid classified watermarking technique*, Hazem Munawer Al-Otum

TBA*  *Adaptive color image watermarking based on the just noticeable distortion model in balanced multiwavelet domain*, Yuan Zhang and Yong Ding

**Errata**


**Book Review**

TBA*  *Computational Photography: Methods and Applications, Rastislav Lukac, Ed.*, Hayder Radha

* paper number not available at time of publication

---

**BENEFIT FROM A WIDER AUDIENCE FOR YOUR WORK AND FROM THE RECOGNITION OF PUBLISHING IN AN ARCHIVED JOURNAL**

*JIST and JEI are the premier journals for research publications in imaging and image processing.*

If you would like your research to be read by leading imaging scientists and engineers in both industry and academia, consider submitting your work to JIST or JEI. Both journals welcome novel work that is previously unpublished and also expanded versions of articles that may have previously appeared in an IS&T/SPIE conference, where the expanded article incorporates additional results and/or analysis. In addition, if you have recognized expertise in a given field of imaging/image processing and would like to submit a comprehensive review paper on the topic, please get in touch with the Editors. All papers undergo peer review prior to publication.

—George Chiu, Editor, JIST  
—Gaurav Sharma, Editor, JEI
In Memoriam: Peter Krause


Krause’s spent his career in the photographic industry. He was the assistant technical director at Pavelle Color, Inc. (1946-1954), then worked at Ansco in Binghamton, New York (which later became GAF) as manager of quality control and technical Services, then director of manufacturing, and general manager of European operations (1954-1968). Finally, Krause joined Ciba (later Ciba-Geigy, which acquired Ilford, Inc) becoming president of Ilford, Inc. Krause retired in 1978, although this was not the end of his professional contributions.

After leaving Ilford, Krause became a photographic industry consultant, working for all the major manufacturers. He was well known in particular for his work on color stability and conservation. He consulted regularly for major art museums, periodically wrote columns for Modern Photography and Popular Photography, and was a founding co-editor of Photofinishing News. His editing acumen extended to the Journal of Photographic Science and Engineering, one of the past technical journals of IS&T. Krause was also an active member of several ANSI (American National Standards Institute) committees, as well as ISO (International Standards Organization) working groups.

In the field of photograph conservation, Krause was a frequent source of information especially with regard to color photographs. His research, vast knowledge, and engaging presence inspired many emerging conservators. Few people knew more about Cibachrome/Ilfochrome materials and technology, and chromogenic color technology than him. He is well known for his role as technical advisor when National Geographic had an outbreak of redox blemishes among their autochrome plates in the mid-1980s. (See Krause, P. “Preservation of Autochrome Plates in the Collection of the National Geographic Society,” J. Imaging Sci. 29(5): 182-192 (1985).

In thanks, and recognition for his long relationship with and contributions to the photography community and photograph conservation, PMG honored Peter Krause at the 2007 Rochester joint Winter Meeting of PMG and ICOM-CC Photographic Materials Working Group.

Drafted when the US entered World War II, Krause served as a Technical Sergeant in the US Army Air Corps Geodetic Control Squadron until the end of the war. An avid tennis player and skier, he also was active in civic life, serving on the school board of Northern Highlands Regional High School in Allendale, NJ for many years.

He is survived by his wife of 53 years, Joan, four children, four grand-children, and two great-grand-children. •
I recently prepared an update of the current status of standards for the printing and publishing industry. As the audience for that article has virtually no overlap with the Reporter audience it seemed appropriate to share some parts of that update with the IS&T audience.

Overview
There continues to be growing interest in International Standards within the world wide printing industry. As of mid-2011 ISO TC130, Graphic technology, has 26 participating countries and 16 observer countries. New country members include: Australia, Indonesia, Korea, and Israel.

The scope of the work within TC130 also continues to expand. In 2010 four new Working Groups (WGs) were formed and Task Force 4 (TF4) was added to WG2. The new WGs are: WG10, Security Printing; WG11, Carbon Footprint; WG12, Post Press; and WG13 Printing Conformance. The new TF in WG2 is charged with moving the generic portion of Adobe XMP into an ISO standard and standardizing those parts of XMP specific to the needs of the Graphic Arts Industry.

A brief summary of some of the more important developments that have occurred in the last year and a prediction of some of the things that we hope to see happen in the next year or so follows.

File Formats
PDF/X The ISO-defined PDF/X file formats are the dominant format for exchange of graphic arts content data and their use, and impact continues to increase. TIFF/IT continues to be viable in some parts of the world and file exchange for variable data printing is becoming a priority item. The PDF/X (ISO 15930) family of standards is stable and no new requirements have been added.

PDF/X-3 (ISO 15930-3) has been withdrawn because there were no know implementations and it has been technically superseded by PDF/X-5, ISO 15930-5.

WG2 TF 2 will continue to look at longer term issues such as: spot color and ink definition issues, alignment with ISO 32000-2 (PDF) and the new features it will contain, black point compensation, and page-level output Intents. The goal for these revisions is a 3 to 4 year timeframe.

PDF/VT ISO 16612-2, Graphic technology — Variable data exchange — Part 2: Using PDF/X-4 and PDF/X-5 (PDF/VT-1 and PDF/VT-2), has been published. It is largely based on PDF 1.6 as restricted by PDF/X-4 and PDF/X-5, and is designed to enable variable document printing in a variety of environments from desktop printers to digital production presses. This includes hybrid workflows involving both conventional and digital printing. It does not provide for the transmission of process control information but is constructed to enable its use with JDF or a similar job ticket format.

PDF/A TC130 is a participant in Joint Working Group 5 (JWG5) of ISO TC171/SC2 (Document management applications/Applications issues). This JWG is working on a second document in the PDF/A series. It will be identified as ISO 19005-2, Document management – Electronic document file format for long-term preservation – Part 2: Use of ISO 32000-1 (PDF/A-2). It is expected to add further capabilities to, but not replace, PDF/A-1 (ISO 19005-1:2005).

PDF ISO 32000-1:2008, Document management — Portable document format — Part 1: PDF 1.7 was published in July 2008. Since that time a Joint Working Group (JWG8-PDF/REF) under ISO TC171/SC2 (Document management applications/Applications issues) has been working to develop ISO 32000-2, which will be PDF 2.0. TC130 has been a key participant in providing input to PDF 2.0 to allow the capabilities of the PDF/X family to be expanded to meet future needs of the graphic arts industry. (The application area specific PDF standards such as PDF/X are all based on the PDF standard and do not add new capabilities to the basic PDF architecture.)

Measurement and Process Control Data Formats
Work is underway on ISO 17972, Graphic technology — Colour data exchange format (CxF), which is an XML-based standard built on the X-Rite CxF 3.0 file format. CxF itself contains Core Resources which identify various elements and their definition. In addition CxF makes provision for Custom Resources which the standards community will use to define use of the CxF format for specific graphic arts applications. Four parts of ISO 17972 have currently been identified and are in development. These are: Part 1: Relationship to CxF3; Part 2: Scanner target data; Part 3: Printer target data and Part 4: Spot colour characterization data.

Reference Printing Conditions and Process Definition
As we have said many times, meaningful data exchange is dependant on a clear definition of the intended color appearance of the content data being transmitted. The mechanisms used to convey the intended color appearance are pointers to characterization data and/or ICC profiles based on such characterization data. The use of the ICC Characterization Registry (www.color.org/registry2.html) has become the accepted reference for characterization data. Most of the characterization data posted on the ICC website, and other references, is based on the printing conditions defined in the ISO 12647 series of standards.

The ISO 12647 family of process definition standards have provided a firm basis for the world wide standardization of
printing. However, these standards are process and substrate specific and are largely based on characterization data of "real" printing. The recent increases in the use of optical brightening agents (OBAs) in printing paper coupled with a desire to “fine-tune” printing aims to the behavior of a specific paper process definition has led to proposals to significantly increase the reference printing conditions defined.

At the same time a new approach is being proposed in ISO 15339, Graphic technology — Printing from digital data across multiple technologies. This standard, often referred to as “process agnostic,” builds on three concepts that have only recently become viable in graphic arts data manipulation. The first of these is the understanding that color characterization data (the relationship between CMYK input data and the colorimetric definition of the associated printed color) is a complete definition of a printing or proofing process. The second is that if the outer gamut (CMYKRGB solids) of a real ink, paper, press combination matches a reference printing condition, the within-gamut (overprint) data can be manipulated using color management, plating curves, etc. to allow the printed color to match the desired characterization data. The third step is based on the assumption that for process-color halftone printing, paper can be treated as a fifth color and a data manipulation process, called the tristimulus correction technique, can be used to adjust characterization data for changes in substrate color.

This has led to the proposal that seven characterized reference printing conditions could be used as the reference, or nodal point, between content preparation, proofing, and printing. This would greatly simplify the preparation and exchange of data for a large portion of the printing industry. (It obviously will not apply to most package and product printing which by their very nature do not embrace open data exchange.) This would also be the first time that characterization data itself would be part of an International Standard rather than being the responsibility of industry trade groups. Part 1: Principles and characterized reference printing conditions, of ISO 15339 is currently in development and balloting.

Although some see ISO 15339 and ISO 12647 as competitors, the proponents of ISO 15339 see them working together to fill the needs of the market and allowing users to transition from the traditional to the color managed workflows as their skills, needs, and tools dictate.

Metadata
WG2/TF4 was added to WG2 to help shepherd the Adobe XMP specification into ISO. That task has been completed with the publication of ISO 16684-1, Graphics technology — Extensible metadata platform (XMP) specification — Part 1: Data model, serialization and core properties.

This document defines two essential components of XMP metadata. The data model is the most fundamental aspect. This is an abstract model that defines the forms of XMP metadata items, essentially the structure of statements that XMP can make about resources. The second part, the serialization of XMP, defines how any instance of the XMP data model can be recorded as XML. In addition a collection of core properties are defined. These are XMP metadata items that can be applied across a broad range of file formats and domains of usage.

In addition WG2/TF4 will be developing additional generic standards in the ISO 16684 series as well as graphic-arts-specific metadata standards that will build on ISO 16684.

TC42 has also created WG25 (Joint with TC130) to develop photographic-specific metadata standards building on ISO 16684.

Color Proofing
ISO 12647-8, Graphic technology — Process control for the production of halftone colour separations, proof and production prints — Part 8: Validation print processes working directly from digital data, has been completed and published.

The current work is focused on soft-proofing with the development of ISO 14861, Graphic technology — Requirements for colour soft proofing systems, and the revision of ISO 12646, Graphic technology — Displays for colour proofing — Characteristics and viewing conditions. The approach being used is to put all of the display requirements in ISO 12646 and the integration and soft-proofing data and validation requirements in ISO 14861. It is hoped that this work will be completed in 2012.

ICC Color Management
The ICC work on a coordinated revision of both ICC.1 and ISO 15076-1:2005 has been completed. ICC.1:2010 and ISO 15076-1:2010, Image technology colour management — Architecture, profile format, and data structure — Part 1: Based on ICC.1:2010, has been completed and published.

Test Images
ISO 12640-4:2011, Graphic technology — Prepress digital data exchange — Part 4: Wide gamut display-referred standard colour image data (AdobeRGB(1998)/SCID), has been completed and published. It includes a set of display-referred images based on the Adobe RGB color gamut, and complements the existing XYZ/SCID images of ISO 12640-2, which are based on the sRGB display gamut.

ISO 12640-5, Graphic technology — Prepress digital data exchange — Part 5: Scene-referred standard colour image data (RIMM/SCID) is in development. It includes a set of scene-referred images, encoded as RIMM-RGB (ISO 22028-3). These scene-referred images will complement the rest of the images of 12640, which are all rendered images. Work on ISO 12640-5 is being done in TC130/JWG9, a joint activity between TC130 and TC42 (Photography).

For suggestions for (or input to) future updates, or standards questions in general, please contact the editor at mcdowell@npes.org.
Announcing Two New IS&T/Wiley Books

Special offer includes shipping anywhere in the world!

The 4th edition of Robert Hunt’s seminal Measuring Colour and a new work on High-Dynamic Range Imaging

MEASURING COLOUR, 4TH EDITION

List Price: $110
Amazon price $96 on 10/11/11

THE ART AND SCIENCE OF HDR IMAGING

List Price: $135
Amazon price $116 on 10/11/11

to take advantage of this special offer, visit www.imaging.org

*price includes shipping anywhere in the world; price guaranteed through January 31, 2011