CCIW2013
IAPR The Fourth Computational Color Imaging Workshop
3-5 March 2013, Chiba, Japan

Advance Program
CCIW2013

IAPR The Fourth Computational Color Imaging Workshop

Date : 3-5 March 2013
Venue : Keyaki Kaikan (Univ. Hall), Chiba University, Chiba, Japan
Website : http://dippix.tp.chiba-u.jp/CCIW2013/

CCIW2013 Co-Chairs:
Shoji Tominaga, Chiba University, Chiba, Japan
Raimondo Schettini, University of Milano Bicocca, Milano, Italy
Alain Trémeau, Université Jean Monnet, Saint Etienne, France

Keynote :
Prof. Brian. A. Wandell (Stanford University)

Invited Talks:
Prof. Hidehiko Komatsu (National Institute for Physiological Sciences)
Prof. James A. Ferwerda (Rochester Institute of Technology)
Dr. Joost Van de Weijer (Computer Vision Center Barcelona)
Dr. Francisco Imai (Canon U.S.A. Inc)

Tutorials:
Prof. Brian. A. Wandell (Stanford University)
Prof. Lindsay. W. MacDonald (University College London)

Oral Sessions:
Color image perception
Color combination
Multi-spectral image analysis and rendering
Color image detection and classification
Color image features
Color image filtering and enhancement
Endorsement by

Published in

Sponsors

Exhibitors
Schedule at a Glance

March 3, 2013: CCIW2013 Pre-event
- Tutorial 1:
  Prof. Brian A. Wandell, Stanford University
  "How Wavelength Becomes Color: Foundations of Human Color Science"
- Tutorial 2:
  Prof. Lindsay W. MacDonald, University College London
  "Using Real and Synthesized Reflectance Spectra in Color Imaging"
- Laboratory Tour of Color and Imaging at Chiba University
- Reception

March 4, 2013: CCIW2013 Day1
- Keynote:
  Prof. Brian A. Wandell, Stanford University
  "Color Perception Networks in Human Cortex"
- Invited Talk 1:
  Prof. Hidehiko Komatsu, National Institute for Physiological Sciences
  "'Yellow' or 'Gold'? : Neural Processing of Gloss Information"
- Invited Talk 2:
  Prof. James A. Ferwerda, Rochester Institute of Technology
  "Tangible Images : Bridging the Real and Virtual Worlds"
- Oral Sessions:
  Color Image Perception, Color Combination, Multi-Spectral Image Analysis and Rendering

March 5, 2013: CCIW2013 Day2
- Invited Talk 3:
  Dr. Joost van de Weijer, Computer Vision Center Barcelona
  "Combining Color and Shape for Object Recognition"
- Invited Talk 4:
  Dr. Francisco Imai, Canon U.S.A. Inc
  "Computational Spectral Imaging based on Adaptive Spectral Imaging"
- Oral Sessions:
  Color Image Detection and Classification, Color Image Features, Color Image Filtering and Enhancement
- Round table
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<thead>
<tr>
<th>Date</th>
<th>Sun. 3 March</th>
<th>Mon. 4 March</th>
<th>Tue. 5 March</th>
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<tbody>
<tr>
<td>Event</td>
<td>CCIW2013 Pre-event</td>
<td>CCIW2013 Day1</td>
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<td>8:00</td>
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<td>8:30</td>
<td>9:00 - 9:40 (40min) Keynote Speech Prof. B. A. Wandell</td>
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<td>10:30</td>
<td>11:30 - 13:00 (90min) Lunch Break</td>
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<td>11:00</td>
<td>13:00 - 13:40 (40min) Invited Talk 1 Prof. H. Komatsu</td>
<td>13:00 - 13:40 (40min) Invited Talk 4 Dr. F. Imai</td>
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<td>11:30</td>
<td>13:40 - 14:40 (60min) Oral 2 (3 Papers) Color Combination</td>
<td>13:40 - 14:40 (60min) Oral 5 (3 Papers) Color Image Features</td>
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<td>12:00</td>
<td>15:10 - 15:50 (40min) Invited Talk 2 Prof. J. A. Ferwerda</td>
<td>15:10 - 16:10 (60min) Oral 6 (3 Papers) Color Image Filtering and Enhancement</td>
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<td>12:30</td>
<td>16:00 - 16:30 (80min) Oral 3 (4 Papers) Multi-Spectral Image Analysis and Rendering</td>
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<td>13:40</td>
<td>16:00 - 16:20 (30min) Lab Tour</td>
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<td>16:20 - 17:20 (60min) Round Table</td>
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<td>15:00</td>
<td>18:00 - 20:00 (120min) Reception @Colza(Chiba Univ.)</td>
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**Notes:**
- Keynote: 40min, 1 talk
- Invited: 40min, 4 talks
- Oral: 20min, 21 talks (Day1: 11 talks, Day2: 10 talks)
Tutorials

Tutorial 1:
Prof. Brian. A. Wandell (Stanford University)
"Foundations of Color: How wavelength becomes color"

Abstract:
I will describe our current understanding of how the human brain derives the perception of color from the wavelength information arriving at the eye. Many properties of color can be understood by the retinal encoding of light in the cone photoreceptors and the subsequent retinal circuits. Additional aspects of color appearance depend crucially on circuits in visual cortex. The responses to colored stimuli differ across the brain, and it seems likely that only some portions of the brain are essential for color appearance. By understanding these differences between cortical circuits we aim to distinguish between the neural processes designed to capture the perception of color from those processes, such as motion perception, that use color information for other goals. A current hypothesis is that wavelength information is used in multiple cortical circuits; some of these circuits are essential for color appearance and other circuits use wavelength information to assist with other visual functions.

Tutorial 2:
Prof. Lindsay. W. MacDonald (University College London)
"Using Real and Synthesized Reflectance Spectra in Color Imaging"

Abstract:
The reflectance of a point on the surface of a real-world object is characterised by the spectral reflectance distribution, typically measured at wavelength intervals of 5 or 10 nm. It can be represented by a vector, enabling colorimetric computation with corresponding vectors for the spectral power distribution of a light source and the sensitivity of an observer. Large sets of reflectance spectra, containing thousands of vectors, can be analysed to determine the number of degrees of freedom, for example by principal component analysis.

The RGB-to-XYZ transfer function of digital cameras with broad-band spectral sensitivity in each channel can be approximated well by polynomial functions trained on large sets of reflectance spectra. For narrow-band sensors (and especially in the limiting case of monochromatic laser scanners), however, the colorimetric errors of such approximations may be very large. In this tutorial it will be shown how synthetic
reflectance spectra may be generated with ‘realistic’ spectral waveforms. Millions of such spectra can then be used to populate a multi-dimensional lookup table to generate a transformation that adapts to different regions of color space and thus minimises the encoding errors for all possible input reflectance spectra. The method can readily be extended to multispectral imaging systems.
Keynote / Invited Talks

Keynote:
Prof. Brian. A. Wandell (Stanford University)
"Color Perception Networks in Human Cortex"

Abstract:
Color has been an excellent model system for developing a quantitative understanding of visual perception. We understand a great deal about the physical signal that initiates color perception, and this knowledge has led to a precise understanding of the retinal encoding of the color signal. A next challenge is to understand how these retinal signals are interpreted by cortical circuits of the brain.

Over the last twenty years, a number of studies have analyzed how human visual cortex responds to retinal signals and creates the experience of color. These studies used a range of methods - including cortical lesions, non-invasive measurements with functional MRI, and intracranial measurements using electrodes implanted within the brain. We now understand that the responses to colored stimuli are distributed throughout cortex, but lesions in certain specific locations are particularly likely to interfere with the ability to judge color appearance. Each cortical region has its own spatial and temporal and chromatic sensitivity, and these quantitative measures suggest specific functional tasks for each region. This talk will be an introduction to the field of human neuroimaging of color networks, summarizing findings from several labs.

Collaborative work with H. Horiguchi, J. Winawer, and H. Takemur

Invited Talk 1:
Prof. Hidehiko Komatsu (National Institute for Physiological Sciences)
"'Yellow' or 'Gold'? : Neural Processing of Gloss Information"

Abstract:
Although color term 'Gold' is commonly used, traditional color science cannot deal with 'Gold' because there is no region corresponding to 'Gold' in the chromaticity diagram generated based on the color matching experiments. Appearance of an object changes from 'Yellow' to 'Gold' with an increase in the specular reflectance, and understanding how we discriminate 'Gold' from 'Yellow' is tightly related to an important problem of how we perceive surface reflectance or gloss of objects. To understand neural processes underlying gloss perception, we conducted a series of experiments. When we compared
neural activities evoked by objects with specular and matte surfaces using functional magnetic resonance imaging in monkeys, stronger activities to specular surface were observed in areas along the ventral pathway of the visual cortex including the inferior temporal (IT) cortex that plays an essential role in object discrimination. We also recorded single neuron activities from IT cortex and found that there exist neurons that are selectively responding to specific gloss, and that as a population, these neurons systematically represent a variety of glosses. We speculate that visual features distinguishing surface glosses are detected in early visual areas and this information is integrated along the ventral visual pathway to form neural representation of a variety of glosses of object images in IT cortex. Neural mechanisms underlying discrimination between 'Gold' and 'Yellow' should at least in part lie in this process.

Invited Talk 2:
Prof. James A. Ferwerda (Rochester Institute of Technology)
"Tangible Images : Bridging the Real and Virtual Worlds"

Abstract:
In this talk we present our efforts to create tangible imaging systems that provide rich virtual representations of real-world surfaces. Tangible imaging systems have three main properties: 1) the images produced must be visually realistic; 2) the images must be responsive to user interaction; and 3) the images must be situated, appearing to be integrated with their environments. Our current system, based on a computer, LCD display, light and position sensors, and graphics rendering tools meets all these requirements; supporting the accurate simulation of the appearances of surfaces with complex textures and material properties, and allowing users to interact with and experience these virtual surfaces as if they were real ones. We first describe the components of our current system and its implementation. We then illustrate the system's capabilities for simulating the appearances and behaviors of real-world surfaces. Finally we describe some potential applications of tangible imaging systems and discuss limitations and future work.

Invited Talk 3:
Dr. Joost van de Weijer (Computer Vision Center Barcelona)
"Combining Color and Shape for Object Recognition"

Abstract:
For many object recognition systems it is important to combine information from various
cues. The two main strategies to combine multiple cues, known as early- and late fusion both suffer from significant drawbacks. In this talk I present two novel methods for combining shape and color cues. Firstly, I discuss a method which is motivated from human color vision, called Color Attention. Color is used to construct a top-down category-specific attention map. The color attention map is then further deployed to modulate the shape features by taking more features from regions within an image that are likely to contain an object instance. Secondly, I will outline an information theoretical approach to the problem of color and shape combination. This leads to a novel approach to the construction of visual word dictionaries, which we coined Portmanteau vocabulary. Evaluation of both approaches on several benchmark data sets shows that the proposed methods outperform both early- and late fusion.

Invited Talk 4:
Dr. Francisco Imai (Canon U.S.A. Inc.)
"Computational Spectral Imaging based on Adaptive Spectral Imaging"

Abstract:
This paper presents a new paradigm on adaptive spectral imaging to address practical spectral imaging issues such as robustness of spectral estimation transform, dependency on training sample set and impact of non-uniform illumination on estimation accuracy. Computational spectral imaging using re-configurable imaging sensors with tunable spectral sensitivities is introduced as a possible powerful approach to address these practical spectral reconstruction issues. As an example of effectiveness of reconfigurable imaging sensor embodiment, experiments and results previously presented at the IS&T/SID 19th Color and Imaging Conference is reviewed mentioning potential applications and implementations of proposed computational spectral imaging.
Program - 4 March 2013 : CCIW2013 Day 1

8:50 - 9:00 Welcome Remarks

9:00 - 9:40 Keynote

"Color Perception Networks in Human Cortex," Brian A. Wandell

(9:40 - 10:10 Coffee Break)

10:10 - 11:30 Oral Session 1 : Color Image Perception

"On the Uniform Sampling of CIELAB Color Space and the Number of Discernible Colors," Jean-Baptiste Thomas, Philippe Colantoni and Alain Trémeau

"Image Statistics for Golden Appearance of a Painting by a Japanese Edo-era Artist Jakuchū Ito," Gouki Okazawa and Hidehiko Komatsu

"Considerations of the Affective Factors for Appreciating a Printed-color Picture," Misako Yamagishi, Chiho Kubo and Kazuo Yamaba

"How Bright is the Moon? Recovering and Using Absolute Luminance Values from Internet Images," Jens Ackermann and Michael Goesele

(11:30 - 13:00 Lunch Break)

13:00 - 13:40 Invited Talk 1

"'Yellow' or 'Gold'? : Neural Processing of Gloss Information," Hidehiko Komatsu

13:40 - 14:40 Oral Session 2 : Color Combination

"Saliency-guided Consistent Color Harmonization," Yoann Baveye, Fabrice Urban, Christel Chamaret, Vincent Demoulin and Pierre Hellier

"An Optimal Text/Background Color Combination of LED Information Boards for Visibility Improvement Based on Psychological Measurements," Aya Shiraiwa, Eriko Aiba, Takayuki Shimotomai, Hiroya Inome and Noriko Nagata

"High Contrast Color Sets Under Multiple Illuminants," Simone Bianco and Andrea G. Citrolo

(14:40 - 15:10 Coffee Break)
15:10 - 15:50 Invited Talk 2

"Tangible Images : Bridging the Real and Virtual Worlds," James A. Ferwerda

(15:50 - 16:00 Break)

16:00 - 17:20 Oral Session 3 : Multi-Spectral Image Analysis and Rendering

"Multispectral Imaging of Degraded Parchment," Lindsay MacDonald, Alejandro Giacometti, Alberto Campagnolo, Stuart Robson, Tim Weyrich, Melissa Terras and Adam Gibson

"CFA based Simultaneous Multispectral Imaging and Illuminant Estimation," Raju Shrestha and Jon Yngve Hardeberg

"Precise Estimation of Painting Surfaces for Digital Archiving," Tetsushi Tanimoto, Takahiko Horiuchi and Shoji Tominaga


Program - 5 March 2013 : CCIW2013 Day 2

9:00 - 9:40 Invited Talk 3

"Combining Color and Shape for Object Recognition," Joost van de Weijer

(9:40 - 10:10 Coffee Break)

10:10 - 11:30 Oral Session 4 : Color Image Detection and Classification

"Computational Strategies for Skin Detection," Simone Bianco, Francesca Gasparini and Raimondo Schettini

"Video-rate Hair Tracking System Using Kinect," Kazumasa Suzuki, Haiyuan Wu and Qian Chen

"Retinal Spectral Image Analysis Methods using Spectral Reflectance Pattern Recognition," G M Atiqr Rahaman, Jussi Parkkinen, Markku Hauta-Kasari and Ole Norberg
"Illuminant Invariant Descriptors for Color Texture Classification," Claudio Cusano, Paolo Napoletano and Raimondo Schettini

(11:30 - 13:00 Lunch Break)

13:00 - 13:40 Invited Talk 4
"Computational Spectral Imaging based on Adaptive Spectral Imaging," Francisco Imai

13:40 - 14:40 Oral Session 5 : Color Image Features
"Fisher Information and the Combination of RGB channels," Reiner Lenz and Vasileios Zografos
"A Comparative Study of Color Texture Features for Face Analysis," Seung Ho Lee, Hyungil Kim and Yong Man Ro
"2½D Scene Reconstruction of Indoor Scenes from Single RGB-D Images," Natalia Neverova, Damien Musele and Alain Trémeau

(14:40 - 15:10 Coffee Break)

15:10 - 16:10 Oral Session 6 : Color Image Filtering and Enhancement
"Reduced Ordering Technique of Impulsive Noise Removal in Color Images," Bogdan Smolka and Krystyna Malik
"Joint Visual Sharpness-Contrast-Tone Mapping Model," Hiroaki Kotera

(16:10 - 16:20 Break)

16:20 - 17:20 Round Table
Chiba University
Nishi-Chiba Campus

CCIW2013
Date: 3-5 March 2013
Venue: Keyaki Kaikan (Univ. Hall)
(7-min walk from JR Nishi-Chiba Station)
(7-min walk from Keisei Midori-Dai Station)