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**Electronic
Imaging**
SCIENCE AND TECHNOLOGY

PROCEEDINGS

28 January 2018 – 1 February 2018 • Burlingame, CA, USA

Computational Imaging XVI

Editors: **Charles A. Bouman**, Purdue Univ. (United States),
Robert Stevenson, Univ. of Notre Dame (United States)

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Computational Imaging XVI

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Conference Chairs

Charles A. Bouman, Purdue Univ. (United States)
Robert Stevenson, Univ. of Notre Dame (United States)

Introduction

More than ever before, computers and computation are critical to the image formation process. Across diverse applications and fields, remarkably similar imaging problems appear, requiring sophisticated mathematical, statistical, and algorithmic tools. This conference focuses on imaging as a marriage of computation with physical devices. It emphasizes the interplay between mathematical theory, physical models, and computational algorithms that enable effective current and future imaging systems. Contributions to the conference are solicited on topics ranging from fundamental theoretical advances to detailed system-level implementations and case studies.

This year Computational Imaging hosted a special session on Computational Imaging for Advanced Manufacturing. Presentations covered such topics as advances in metallic 3D printing, neutron tomography, and more, presented by researchers at Oak Ridge National Laboratory and Wright-Patterson AFB.

Computational Imaging XVI

Monday January 29, 2018

Tomography

8:50 – 10:10 am

Harbour A-B

8:50 COIMG-101

Accelerating iterative image reconstruction via adaptive surrogate functions, Ayan Mitra¹, David Politte², and Joseph O’Sullivan¹;
¹Washington University in St. Louis and ²Washington University School of Medicine (United States)

9:10 COIMG-102

Distributed framework for fast iterative CT reconstruction from view-subsets, Venkatesh Sridhar, Gregory Buzzard, and Charles Bouman, Purdue University (United States)

9:30 COIMG-103

Ultrasonic model-based iterative reconstruction with spatially variant regularization for one-sided non-destructive evaluation, Hani Almansouri¹, Singanallur Venkatakrishnan², Dwight Clayton², Yarom Polsky², Charles Bouman¹, and Hector Santos-Villalobos²; ¹Purdue University and ²Oak Ridge National Laboratory (United States)

9:50 COIMG-472

Deep learning based sinogram correction for metal artifact reduction, Muhammad Usman Ghani and W. Clem Karl, Boston University (United States)

10:10 – 10:50 am Coffee Break

Smart Imaging

10:50 am – 12:30 pm

Harbour A-B

10:50 COIMG-130 [no paper]

Autonomous alpha matting using consensus equilibrium, Stanley Chan¹, Xiran Wang¹, and Jason Juang²; ¹Purdue University and ²HypeVR Inc. (United States)

11:10 COIMG-131

SLADS-Net: Supervised learning approach for dynamic sampling using deep neural networks, Yan Zhang¹, Dilshan Godaliyadda², Nicola Ferrier¹, Emine Gulsoy³, Charles Bouman², and Charudatta Phatak¹; ¹Argonne National Laboratory, ²Purdue University, and ³Northwestern University (United States)

11:30 COIMG-132

A supervised learning approach for dynamic sampling (SLADS) in raman hyperspectral imaging, Shijie Zhang¹, Zhengjian Song¹, Dilshan Godaliyadda¹, Dong Hye Ye¹, Atanu Sengupta², Gregory Buzzard¹, Charles Bouman¹, and Garth Simpson¹; ¹Purdue University (United States) and ²Dr. Reddy’s Laboratory (India)

11:50 COIMG-133

Data-driven compressed sensing tomography, Marc Kassubeck¹, Stephan Wenger¹, Chris A. Jennings², Matthew Gomez², Eric Harding², Jens Schwarz², and Marcus Magnor¹; ¹ITU Braunschweig (Germany) and ²Sandia National Laboratories (United States)

12:10

COIMG-134

Feature selection for material identification in spectral CT, Parisa Babaheidarian and David Castañón, Boston University (United States)

12:30 – 2:00 pm Lunch

Plenary Session

2:00 – 3:00 pm

Grand Peninsula Ballroom D

Overview of Modern Machine Learning and Deep Neural Networks - Impact on Imaging and the Field of Computer Vision, Greg Corrado, Google, Inc. (United States)

Dr. Greg Corrado, co-founder of Google Brain, principal scientist, and director of augmented intelligence research at Google, provides an overview of modern machine learning and deep neural networks, with particular attention to its impact on imaging and the field of computer vision.

Dr. Corrado is a senior research scientist interested in biological neuroscience, artificial intelligence, and scalable machine learning. He has published in fields ranging across behavioral economics, neuromorphic device physics, systems neuroscience, and deep learning. At Google he has worked for some time on brain inspired computing, and most recently has served as one of the founding members and the co-technical lead of Google’s large scale deep neural networks project. Prior to joining Google, Dr. Corrado was a staff research scientist at IBM. He received his MS in computer science and PhD in neuroscience from Stanford University.

3:00 – 3:30 pm Coffee Break

Special Session on: Computational Imaging for Advanced Manufacturing JOINT SESSION

Session Chairs: Vincent Paquit and Hector Santos-Villalobos, Oak Ridge National Laboratory (United States)

3:30 – 5:10 pm

Harbour A-B

This session is jointly sponsored by: Computational Imaging XVI and Intelligent Robotics and Industrial Applications using Computer Vision 2018.

3:30 COIMG-177 [no paper]

Advanced manufacturing research activities in the scaling of additive, battery, carbon fiber, and composites fabrication, William Peter, Merlin Theodore, Lonnie Love, Ryan Dehoff, Vlastimil Kunc, and Vincent Paquit, Oak Ridge National Laboratory (United States)

3:50 COIMG-178 [no paper]

Automated in-situ defects detection in metal additive manufacturing parts, Vincent Paquit, James Ferguson, Sean Yoder, Michael Kirka, and Ryan Dehoff, Oak Ridge National Laboratory (United States)

4:10 COIMG-179 [no paper]

Spectral neutron tomography for crystalline materials, Singanallur Venkatakrishnan¹, Luc Dessieux², and Philip Bingham¹; ¹Oak Ridge National Laboratory and ²University of Tennessee Knoxville (United States)

4:30 COIMG-180 [no paper]
Application of characterization, modeling and analytics towards understanding process-structure-property relationships in metallic 3D printing, Michael Groeber, Edwin Schwalbach, Sean Donegan, Kevin Chaput, Todd Butler, and Jonathan Miller, Wright-Patterson AFB (United States)

4:50 COIMG-181
Separable models for cone-beam MBIR reconstruction, Thilo Balke¹, Soumendu Majee¹, Gregory Buzzard¹, Scott Poveromo², Patrick Howard³, Michael Groeber⁴, John McClure⁴, and Charles Bouman¹; ¹Purdue University, ²Northrop Grumman Corporation, ³GE Aviation, and ⁴Wright-Patterson AFB (United States)

5:00 – 6:00 pm All-Conference Welcome Reception

Tuesday January 30, 2018

7:15 – 8:45 am Women in Electronic Imaging Breakfast

Image Analysis and Modeling I

9:10 – 10:10 am

Harbour A-B

9:10 COIMG-199
Tubule segmentation of fluorescence microscopy images based on convolutional neural networks with inhomogeneity correction, Soonam Lee¹, Chichen Fu¹, Paul Salama², Kenneth Dunn², and Edward Delp¹; ¹Purdue University and ²Indiana University (United States)

9:30 COIMG-200
Development of screening echocardiogram for detection of asymptomatic left ventricular dysfunction, Irmina Gradus-Pizlo¹, Kunal Agrawal², Edward Delp², and Zygmunt Pizlo¹; ¹University of California Irvine and ²Purdue University (United States)

9:50 COIMG-201
Deep gang graffiti component analysis, He Li, Joonsoo Kim, and Edward Delp, Purdue University (United States)

10:00 am – 7:30 pm Industry Exhibition

10:10 – 10:50 am Coffee Break

Image Analysis and Modeling II

10:50 am – 12:30 pm

Harbour A-B

10:50 COIMG-227
Simulation of rare events in images, Shruthi Kubatur and Mary Comer, Purdue University (United States)

11:10 COIMG-228
Top down approach to height histogram estimation of biomass sorghum in the field, Jihui Jin, Gefen Kohavi, Zhi Ji, and Avideh Zakhor, University of California, Berkeley (United States)

11:30 COIMG-229
Recovery of Soil Moisture Active Passive (SMAP) instrument's active measurements via coupled dictionary learning, Konstantina Fotiadou^{1,2}, Grigorios Tsagkatakis¹, Mahta Moghaddam³, and Panagiotis Tsakalides^{1,2}; ¹Foundation for Research and Technology (Greece), ²University of Crete (Greece), and ³University of Southern California, Los Angeles (United States)

11:50 COIMG-230
A marked point process model incorporating active contours boundary energy, Camilo Aguilar Herrera and Mary Comer, Purdue University (United States)

12:10 COIMG-471
Square coded aperture: A large aperture with extended depth of field, Ruojun He¹, Yi Zhang², and Keigo Hirakawa³; ¹China University of Political Science and Law School (China), ²Argo AI, LLC (United States), and ³University of Dayton (United States)

12:30 – 2:00 pm Lunch

Plenary Session

2:00 – 3:00 pm

Grand Peninsula Ballroom D

Fast, Automated 3D Modeling of Buildings and Other GPS Denied Environments, Avideh Zakhor, University of California, Berkeley (United States)

Professor Avideh Zakhor discusses fast, automated 3D modeling of buildings and other GPS denied environments with examples from her work in 3D reality capture, and visual and metric documentation of building interiors. Dr. Zakhor is a serial entrepreneur with startups in outdoor mapping, indoor mapping, and microlithography, currently CEO and founder of Indoor Reality, a Silicon Valley startup with products in 3D reality capture, and visual and metric documentation of building interiors.

Dr. Zakhor has been faculty member at University of California, Berkeley since 1994 where she holds the Qualcomm Chair in the electrical engineering and computer science department. She co-founded OPC technology in 1996, which was acquired by Mentor Graphics in 1998, and UrbanScan Inc. in 2005, acquired by Google in 2007. UrbanScan created the first fully automated 3D outdoor mapping system for 3D exterior models of buildings in urban environments. She has received a number of best paper awards in 3D computer vision, image processing, signal processing, is an IEEE fellow, and received the presidential young investigator award in 1992. Dr. Zakhor received her BSc in electrical engineering, from the California Institute of Technology (1983), and her MS (1985) and PhD (1987) in electrical engineering and computer science from MIT.

3:00 – 3:30 pm Coffee Break

Computational Imaging

3:30 – 5:30 pm

Harbour A-B

3:30 COIMG-270
A shooting direction control camera based on computational imaging without mechanical motion, Keigo Takahashi and Tomohiro Yendo, Nagaoka University of Technology (Japan)

3:50 COIMG-271
Fast, automated indoor light detection, classification, and measurement, Craig Hiller and Avideh Zakhor, University of California, Berkeley (United States)

4:10 COIMG-272
Superfast joint demosaicing and super-resolution, Ivan Glazistov and Xenya Petrova, Samsung R&D Institute Rus (Russian Federation)

4:30 COIMG-273
Warping-based motion artifact compensation for multi-line scan light field imaging, Nicole Brosch, Svorad Štolc, and Doris Antensteiner, AIT Austrian Institute of Technology GmbH (Austria)

4:50 COIMG-274
Illuminant estimation using ensembles of multivariate regression trees, Peter van Beek and R. Wayne Oldford, University of Waterloo (Canada)

5:10 COIMG-473
Multiscale matched filter for structured light decoding using sequential MAP estimation, Hasib Siddiqui, Kalin Atanassov, and Magdi Mohamed, Qualcomm Technologies Inc. (United States)

Symposium Demonstration Session

5:30 – 7:30 pm
 Grand Peninsula Ballroom E

Wednesday January 31, 2018

10:00 am – 4:00 pm Industry Exhibition

12:40 – 2:00 pm Lunch

Plenary Session

2:00 – 3:00 pm
 Grand Peninsula Ballroom D

Ubiquitous, Consumer AR Systems to Supplant Smartphones, Ronald T. Azuma, Intel, Corp. (United States)

Dr. Ronald T. Azuma, researcher and augmented reality pioneer, shares his vision for achieving ubiquitous, consumer AR systems. Recent large investments in augmented reality reflect the commercial interest in its inherent potential to replace current smartphone technology, but much remains to be done. In his talk, Dr. Azuma gives a vision for achieving this goal, which requires not just solving numerous technical challenges but also determining new, compelling AR experiences that will establish AR as a new platform and novel form of media.

Dr. Azuma leads a team in Intel Labs that designs and prototypes novel experiences and key enabling technologies to enable new forms of media. These technology areas include computational imaging and photography, computational displays, and head-worn displays. Dr. Azuma is recognized as a pioneer and innovator in augmented reality, and has held prominent leadership roles in that research area, including leading and implementing research projects and demonstrations in areas such as AR, visualization, and mobile applications. Dr. Azuma received his BSc (1988) in electrical engineering from University of California, Berkeley, and MS (1990) and PhD (1995) in computer science from University of North Carolina, Chapel Hill. Prior to joining Intel, he was a research leader at Nokia Research Center Hollywood, and a senior researcher at Hughes Research Laboratories.

3:00 – 3:30 pm Coffee Break

Computational Imaging XVI Interactive (Poster) Papers Session

5:30 – 7:00 pm
 The Grove

The following works will be presented at the EI 2018 Symposium Interactive Papers Session.

COIMG-402
Estimating the UAVs' crash point based on optical flows' voting in the image plane, Yusaku Hatano, Hiroshi Nagahashi, Chen Yi, and Jun Ohya, Waseda University (Japan)

COIMG-403 [no paper]
Noise analysis and restrain of ghost imaging system, Shaofan Qu, Beihang University (China)

Meet the Future: A Showcase of Student and Young Professionals Research

5:30 – 7:30 pm
 The Grove