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PROCEEDINGS

Intelligent Robotics and Industrial Applications using Computer Vision 2018

Editors: **Henry Ngan,** Hong Kong Baptist University (Hong Kong),
Kurt Niel, University of Applied Sciences Upper Austria (Austria),
Juha Röning, University of Oulu (Finland)

These papers represent the program of Electronic Imaging 2018,
held 28 January – 1 February 2018, at the Hyatt Regency San Francisco Airport in Burlingame, CA.

Society for Imaging Science and Technology
7003 Kilworth Lane • Springfield, VA 22151 USA
703/642-9090; 703/642-9094 fax
info@imaging.org; www.imaging.org

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Intelligent Robotics and Industrial Applications using Computer Vision 2018

Introduction

In our everyday work we are facing two big and very complex structures:
On the one hand we are doing **scientific research** in exploring the fundamental behavior of things.
On the other hand we cooperate strongly with **industrial needs** for reliable quality within a reasonable budget.

We all are aware of the gap between these two worlds, with even contradiction demands.
Our conference, **Intelligent Robotics and Industrial Applications using Computer Vision**, tries to serve as a bridge that has to overcome enormous tensions. A lot of contributions highlight the usage of computer vision within robotics guidance and industrial automation processes. The conference promotes the latest results of the research work in these areas. Joint sessions with other conferences are utilized to combine different fields contributing to this field.

In particular for EI 2018, collaborations with the Computational Imaging XVI Conference and the Autonomous Vehicles and Machines 2018 Conference highlight the importance of these topics in the areas of advanced manufacturing and autonomous vehicles.

Henry Ngan, Hong Kong Baptist University (Hong Kong)
Juha Röning, University of Oulu (Finland)
Kurt Niel, University of Applied Sciences Upper Austria (Austria)

Intelligent Robotics and Industrial Applications using Computer Vision 2018

Monday January 29, 2018

Surveillance in Robotics, Vision, and Inspection JOINT SESSION

Session Chair: Sreenath Vantaram, Apple Inc. (United States)

10:40 am – 12:20 pm
Sandpebble C

This session is jointly sponsored by: Intelligent Robotics and Industrial Applications using Computer Vision 2018, and Surveillance Session: Applications and Algorithms.

10:40 IRIACV-125
Recognition and reproduction performance of hand motions with HMD-based motion learning method, *Shin Kinoshita, Yoshihiko Nomura, Ryota Sakamoto, and Tokuhiro Sugiura, Mie University (Japan)*

11:00 IRIACV-126
Robust pose estimation with the stereoscopic camera in harsh environment, *Longchuan Niu[1], Sergey Smirnov[1], Jouni Mattila[1], Atanas Gotchev[1], and Emilio Ruiz[2]; [1]Tampere University of Technology (Finland) and [2]Fusion for Energy (Spain)*

11:20 SRV-127
Predicting rapid fire growth (flashover) using conditional generative adversarial networks, *Kyongsik Yun, Jessi Bustos, and Thomas Lu, NASA Jet Propulsion Laboratory (United States) [Included in this IRIACV proceedings.]*

11:40 SRV-128
Using shape descriptors for UAV detection, *Eren Unlu[1], Emmanuel Zenou[1], and Nicolas Riviere[2]; [1]ISAE-SUPAERO and [2]ONERA (France) [Included in this IRIACV proceedings.]*

12:00 SRV-129 [no paper]
About pixel densities in surveillance, *Vlado Damjanovski, ViDi Labs Pty Ltd. (Australia)*

12:20 – 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
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
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
Spectral neutron tomography for crystalline materials, *Singanallur Venkatakrishnan[1], Luc Dessieux[2], and Philip Bingham[1]; [1]Oak Ridge National Laboratory and [2]University of Tennessee Knoxville (United States)*

4:30 COIMG-180
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 Balke[1], Michael Groeber[2], Gregery Buzzard[1], and Charles Bouman[1]; [1]Purdue University and [2]Wright-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

Machine Vision and Deep Learning

Session Chair: Juha Röning, University of Oulu (Finland)

9:10 – 10:10 am
Sandpebble C

9:10 IRIACV-202
No-reference utility estimation with a convolutional neural network, *Edward Scott[1] and Sheila Hemami[2]; [1]Northeastern University and [2]Draper (United States)*

9:30 IRIACV-203 [no paper]
Haptic industrial robot control and bilateral teleoperation by using a virtual visual interface, *Servet Soyguder[1] and Tayfun ABUT[2]; [1]Firat University and [2]Mus Alparslan University (Turkey)*

9:50 IRIACV-204
A 3D guitar fingering assessing system based on CNN-hand pose estimation and SVR-assessment, *Zhao Wang and Jun Ohya, Waseda University (Japan)*

10:00 am – 7:30 pm Industry Exhibition

10:10 – 10:50 am Coffee Break

Machine Vision and Imaging

Session Chair: Kurt Niel, University of Applied Sciences Upper Austria (Austria)

10:50 am – 12:30 pm
Sandpebble C

10:50 IRIACV-236 [no paper]
Machine vision system for rapid online detection of wooden breast syndrome in chicken fillets, *Seung-Chul Yoon, Brian Bowker, Kurt Lawrence, and Hong Zhuang, US Department of Agriculture-Agricultural Research Service (United States)*

11:10 IRIACV-237
An image processing based method for chewing detection using variable-intensity template, *Atsuto Fujimoto[1], Takaaki Ohkawauchi[2], Junji Yamato[3], and Jun Ohya[1]; [1]Waseda University, [2]Teikyo University, and [3]NTT Communication Science Laboratories (Japan)*

11:30 IRIACV-238
Discriminating the presence of the cerebral aneurysm using shape features obtained from medical images of the cerebral vessel, *Kosei Kikuchi, Takanobu Yagi, Xu Rong, and Jun Ohya, Waseda University (Japan)*

11:50 IRIACV-239
Accumulated relative density outlier detection for large scale traffic data, *Sophia Liu[1], Henry Ngan[1], Michael K. Ng[1], and Steven Simske[2,3]; [1]Hong Kong Baptist University (Hong Kong), [2]Hewlett-Packard Labs, HP Inc., and [3]Colorado State University (United States)*

12:10 IRIACV-240
Geometric calibration and image rectification of a multi-line scan camera for accurate 3D reconstruction, *Bernhard Blaschitz, Svorad Štolc, and Doris Antensteiner, AIT Austrian Institute of Technology GmbH (Austria)*

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 Zahkor 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 micro-lithography, 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

Pattern Recognition and Inspection

Session Chair: Henry Ngan, Hong Kong Baptist University (Hong Kong)

3:30 – 5:30 pm
Sandpebble C

3:30 IRIACV-343 [no paper]
Computational ultrafast optical imaging for single-cell inspection and analysis (Invited), *Edmund Lam, The University of Hong Kong (Hong Kong)*

3:50 IRIACV-275
Featureless-region-based top window recognition for automatic industrial monitoring systems, *Mei-Hsuan Ho, Yu-Hsuan Tsai, Chang-Tao Hsu, and Ren-Hui Chuang; National Chaio Tung University (Taiwan)*

4:10 IRIACV-276
Outlier detection in large-scale traffic data by regression analysis, *Philip Lam[1], Lili Wang[1], Henry Ngan[1], Nelson H.C. Yung[2], and Michael K. Ng[1]; [1]Hong Kong Baptist University and [2]The University of Hong Kong (Hong Kong)*

4:30 IRIACV-277
Part quality assessment using convolution neural networks in high pressure die casting, *Kelly Cashion[1], Nilesh Powar[1], Robert De Neff[2], and Robert Kress[3]; [1]University of Dayton Research Institute, [2]Honda North America, and [3]Honda Transmission Manufacturing (United States)*

4:50 IRIACV-278
Multi-view surface inspection using a rotating table, *Tomoya Kaichi[1], Shohei Mori[1], Hideo Saito[1], Junichi Sugano[2], and Hideyuki Adachi[2]; [1]Keio University and [2]ViSCO Technologies, Ltd. (Japan)*

5:10 IRIACV-279
Bringing machine intelligence to welding visual inspection: Development of low-cost portable embedded device for welding quality control, *Yifu Gong, Zhibin Lin, Jinhui Wang, and Na Gong, North Dakota State University (United States)*

Mapping and Localization

Session Chairs: Umit Batur, Rivian Automotive (United States) and Patrick Denny, Valeo Vision System (Ireland)

3:30 – 5:20 pm
Grand Peninsula Ballroom BC

4:40 AVM-283
Vehicle pose estimation from drive recorder images by monocular SLAM and matching with rendered 3D point cloud of surrounding environment, *Akiyoshi Kurobe[1], Hideo Saito[1], and Hisashi Kinoshita[2]; [1]Keio University and [2]DENSO Corporation (Japan) [Included in this IRIACV proceedings.]*

Symposium Demonstration Session

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

Wednesday January 31, 2018

Robotic Vision Techniques for Navigation and Vision I JOINT SESSION

Session Chairs: Patrick Denny, Valeo Vision Systems (Ireland) and Darnell Moore, Texas Instruments (United States)

8:50 – 10:10 am
Grand Peninsula Ballroom BC

This session is jointly sponsored by: Autonomous Vehicles and Machines 2018, and Intelligent Robotics and Industrial Applications using Computer Vision 2018.

8:50 IRIACV-301
Reliable primitive approximation for estimation of robot grasping parameters using 3D-DNN, *Takuya Torii and Manabu Hashimoto, Chukyo University (Japan)*

9:10 IRIACV-302 [no paper]
Real-time visual loop closure detection for unmanned aerial vehicles, *Semih Karakaya[1], Can Erhan[1], Evangelos Sariyanidi[2], and Hakan Temeltas[1]; [1]Istanbul Teknik Üniversity (Turkey) and [2]Queen Mary University of London (United Kingdom)*

9:30 AVM-303
Semantic image segmentation using Encoder-Decoder Architecture Assisted by Global and Local Attention Models (EDA-GLAM), *Hao Xu, Siyang Li, and Chun-Chieh Kuo, Univeristy of Southern California (United States)*

9:50 AVM-304
A method for reducing the false positives in power line detection, *Alexander Cerón, University Militar Nueva Granada (Colombia)*

10:00 am – 4:00 pm Industry Exhibition

10:10 – 10:50 am Coffee Break

Robotic Vision Techniques for Navigation and Vision II

Session Chairs: Patrick Denny, Valeo Vision Systems (Ireland) and Darnell Moore, Texas Instruments (United States)

10:50 am – 12:40 pm
Grand Peninsula Ballroom BC

This session is jointly sponsored by: Autonomous Vehicles and Machines 2018, and Intelligent Robotics and Industrial Applications using Computer Vision 2018.

10:50 AVM-345
Pedestrian detection at night using deep neural networks and saliency maps (JIST-first), *Duyoung Heo, EunJu Lee, and ByoungChul Ko, Keimyung University (Republic of Korea)*

11:10 AVM-346
Context aware hyperspectral scene analysis, *Christian Winkens and Dietrich Paulus, University of Koblenz-Landau (Germany)*

11:30 AVM-347
Multiple pedestrian tracking in moving vehicle using online learning of random ferns and feature descriptor of pre-trained shallow convolutional neural networks, *SangJun Kim, Jaeyeal Nam, and ByoungChul Ko, Keimyung University (Republic of Korea)*

11:50 AVM-348
Raindrop detection considering extremal regions and salient features, *Vijay C S, Radhesh Bhat, and Vijaya Ragavan, PathPartner Technology Pvt Ltd. (India)*

12:10 AVM-349
Removing shadows and shading from road surfaces in real time, *Bruce Maxwell and Casey Smith, Tandent Vision Science, Inc. (United States)*

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.

Symposium Interactive Papers (Poster) Session

5:30 – 7:30 pm
The Grove

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

5:30 – 7:30 pm
The Grove