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Electronic Imaging

SCIENCE AND TECHNOLOGY

13 January 2019 – 17 January 2019 • Burlingame, CA, USA

Intelligent Robotics and Industrial Applications using Computer Vision 2019

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

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Intelligent Robotics and Industrial Applications using Computer Vision 2019

Conference overview

This conference brings together real-world practitioners and researchers in intelligent robots and computer vision to share recent applications and developments. Topics of interest include the integration of imaging sensors supporting hardware, computers, and algorithms for intelligent robots, manufacturing inspection, characterization, and/or control.

The decreased cost of computational power and vision sensors has motivated the rapid proliferation of machine vision technology in a variety of industries, including aluminum, automotive, forest products, textiles, glass, steel, metal casting, aircraft, chemicals, food, fishing, agriculture, archaeological products, medical products, artistic products, etc. Other industries, such as semiconductor and electronics manufacturing, have been employing machine vision technology for several decades. Machine vision supporting handling robots is another main topic. With respect to intelligent robotics another approach is sensor fusion – combining multi-modal sensors in audio, location, image and video data for signal processing, machine learning and computer vision, and additionally other 3D capturing devices.

There is a need of accurate, fast, and robust detection of objects and their position in space. Their surface, the background and illumination is uncontrolled; in most cases the objects of interest are within a bulk of many others. For both new and existing industrial users of machine vision, there are numerous innovative methods to improve productivity, quality, and compliance with product standards. There are several broad problem areas that have received significant attention in recent years. For example, some industries are collecting enormous amounts of image data from product monitoring systems. New and efficient methods are required to extract insight and to perform process diagnostics based on this historical record. Regarding the physical scale of the measurements, microscopy techniques are nearing resolution limits in fields such as semiconductors, biology, and other nano-scale technologies. Techniques such as resolution enhancement, model-based methods, and statistical imaging may provide the means to extend these systems beyond current capabilities. Furthermore, obtaining real-time and robust measurements in-line or at-line in harsh industrial environments is a challenge for machine vision researchers, especially when the manufacturer cannot make significant changes to their facility or process.

Awards

Best Paper
Best Student Paper

Conference Chairs: **Henry Y.T. Ngan,** ENPS Hong Kong (China); **Kurt Niel,** Upper Austria University of Applied Sciences (Austria); and **Juha Röning,** University of Oulu (Finland)

Program Committee: **Philip Bingham,** Oak Ridge National Laboratory (United States); **Ewald Fauster,** Montan Universitat Leoben (Austria); **Steven Floeder,** 3M Company (United States); **David Fofi,** University de Bourgogne (France); **Shaun Gleason,** Oak Ridge National Lab (United States); **B. Keith Jenkins,** The University of Southern California (United States); **Olivier Laligant,** University de Bourgogne (France); **Edmund Lam,** The University of Hong Kong (Hong Kong, China); **Dah-Jye Lee,** Brigham Young University (United States); **Junning Li,** Keck School of Medicine, University of Southern California (United States); **Wei Liu,** The University of Sheffield (United Kingdom); **Charles McPherson,** Draper Laboratory (United States); **Fabrice Meriaudeau,** University de Bourgogne (France); **Yoshihiko Nomura,** Mie University (Japan); **Lucas Paletta,** JOANNEUM Research Forschungsgesellschaft mbH (Austria); **Vincent Paquit,** Oak Ridge National Laboratory (United States); **Daniel Raviv,** Florida Atlantic University (United States); **Hamed Sari-Sarraf,** Texas Tech University (United States); **Ralph Seulin,** University de Bourgogne (France); **Christophe Stolz,** University de Bourgogne (France); **Svorad Štolc,** AIT Austrian Institute of Technology GmbH (Austria); **Bernard Theisen,** U.S. Army Tank Automotive Research, Development and Engineering Center (United States); **Seung-Chul Yoon,** United States Department of Agriculture Agricultural Research Service (United States); **Gerald Zauner,** FH OÖ–Forschungs & Entwicklungs GmbH (Austria); and **Dili Zhang,** Monotype Imaging (United States)

INTELLIGENT ROBOTICS AND INDUSTRIAL APPLICATIONS USING COMPUTER VISION 2019

Wednesday January 16, 2019

Robotics and Inspection

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

8:50 – 10:10 am
Regency B

8:50 IRIACV-450
Laser quadrat and photogrammetry based autonomous coral reef mapping ocean robot, *Sidhant Gupta, Thanh Bui, King Lui, and Edmund Lam, The University of Hong Kong (Hong Kong)*

9:10 IRIACV-451
Multimodal localization for autonomous agents, *Robert Relyea, Darshan Ramesh Bhanushali, Abhishek Vashist, Amlan Ganguly, Andres Kwasinski, Michael Kuhl, and Ray Ptucha, Rochester Institute of Technology (United States)*

9:30 IRIACV-452
Automatic estimation of the position and orientation of the drill to be grasped and manipulated by the disaster response robot based on analyzing depth information, *Keishi Nishikawa, Waseda University (Japan)*

9:50 IRIACV-453
Automated optical inspection for abnormal-shaped packages, *Wei Lin, Chang-Tao Hsu, Chi Chang, and Jen-Hui Chuang, National Chiao Tung University (Taiwan)*

10:00 am – 3:30 pm Industry Exhibition

10:10 – 10:40 am Coffee Break

Machine Vision and Learning

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

10:40 am – 12:20 pm
Regency B

10:40 IRIACV-454
Foreground-aware statistical models for background estimation, *Edgar Bernal[1], Qun Li[2], and Wencheng Wu[1]; [1]University of Rochester and [2]Microsoft Corporation (United States)*

11:00 IRIACV-455
Change detection in Cadastral 3D models and point clouds and its use for improved texturing, *Sander Klomp[1], Bas Boom[2], Thijs van Lankveld[2], and Peter de With[1]; [1]Eindhoven University of Technology and [2]CycloMedia Technology B.V. (the Netherlands)*

11:20 IRIACV-456
Study on selection of construction waste using sensor fusion, *Masaya Nyumura and Yue Bao, Tokyo City University (Japan)*

11:40 IRIACV-457
Exploring variants of fully convolutional networks with local and global contexts in semantic segmentation problem, *Dong-won Shin, Jun-Yong Park, Chan-Young Sohn, and Yo-Sung Ho, Gwangju Institute of Science and Technology (GIST) (Republic of Korea)*

12:00 IRIACV-458
ECDNet: Efficient Siamese convolutional network for real-time small object change detection from ground vehicles, *Sander Klomp[1], Dennis van de Wouw[1,2], and Peter de With[1]; [1]Eindhoven University of Technology and [2]ViNotion B.V. (the Netherlands)*

12:30 – 2:00 pm Lunch

Wednesday Plenary

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

Light Fields and Light Stages for Photoreal Movies, Games, and Virtual Reality, *Paul Debevec, senior scientist, Google (United States)*

Paul Debevec will discuss the technology and production processes behind "Welcome to Light Fields", the first downloadable virtual reality experience based on light field capture techniques which allow the visual appearance of an explorable volume of space to be recorded and reprojected photorealistically in VR enabling full 6DOF head movement. The lightfields technique differs from conventional approaches such as 3D modelling and photogrammetry. Debevec will discuss the theory and application of the technique. Debevec will also discuss the Light Stage computational illumination and facial scanning systems which use geodesic spheres of inward-pointing LED lights as have been used to create digital actor effects in movies such as Avatar, Benjamin Button, and Gravity, and have recently been used to create photoreal digital actors based on real people in movies such as Furious 7, Blade Runner: 2049, and Ready Player One. The lighting reproduction process of light stages allows omnidirectional lighting environments captured from the real world to be accurately reproduced in a studio, and has recently be extended with multispectral capabilities to enable LED lighting to accurately mimic the color rendition properties of daylight, incandescent, and mixed lighting environments. They have also recently used their full-body light stage in conjunction with natural language processing and automultiscopic video projection to record and project interactive conversations with survivors of the World War II Holocaust.

Paul Debevec is a senior scientist at Google VR, a member of Google VR's Daydream team, and adjunct research professor of computer science in the Viterbi School of Engineering at the University of Southern California, working within the Vision and Graphics Laboratory at the USC Institute for Creative Technologies. Debevec's computer graphics research has been recognized with ACM SIGGRAPH's first Significant New Researcher Award (2001) for "Creative and Innovative Work in the Field of Image-Based Modeling and Rendering", a Scientific and Engineering Academy Award (2010) for "the design and engineering of the Light Stage capture devices and the image-based facial rendering system developed for character relighting in motion pictures" with Tim Hawkins, John Monos, and Mark Sagar, and the SMPTE Progress Medal (2017) in recognition of his achievements and ongoing work in pioneering techniques for illuminating computer-generated objects based on measurement of real-world illumination and their effective commercial application in numerous Hollywood films. In 2014, he was profiled in The New Yorker *magazine's "Pixel Perfect: The Scientist Behind the Digital Cloning of Actors" article by Margaret Talbot.*

3:00 – 3:30 pm Coffee Break

Machine Vision Applications

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

3:30 – 5:30 pm
Regency B

3:30 IRIACV-459
People recognition and position measurement in workplace by fisheye camera, *Haike Guan and Makoto Shinnishi, Ricoh Company, Ltd. (Japan)*

3:50 IRIACV-460
Optical system of industrial camera that achieves both short minimum focusing distance and high resolution, *Yoshifumi Sudoh, Ricoh Company, Ltd. (Japan)*

4:10 IRIACV-461
Investigating camera calibration methods for naturalistic driving studies, *Jeffrey Paone[1], Thomas Karnowski[2], Deniz Aykac[2], Regina Ferrell[2], Jim Goddard[2], and Austin Albright[2]; [1]Colorado School of Mines and [2]Oak Ridge National Laboratory (United States)*

4:30 IRIACV-462
Application of semantic segmentation for an autonomous rail tamping assistance system, *Gerald Zauner[1], Tobias Mueller[2], Andreas Theiss[2], Martin Buerger[2], and Florian Auer[2]; [1]University of Applied Sciences Upper Austria and [2]Plasser & Theurer GmbH (Austria)*

4:50 IRIACV-463
Hazmat label recognition and localization for rescue robots in disaster scenarios, *Raimund Edlinger, Gerald Zauner, Ralph Slabihoud, and Michael Zauner, University of Applied Sciences Upper Austria (Austria)*

5:10 IRIACV-464
Industrial computer vision in academic education - Is there a need besides so many professional business models supporting ready to go solutions?, *Kurt Niel, University of Applied Sciences Upper Austria (Austria)*

Intelligent Robotics and Industrial Applications using Computer Vision 2019 Interactive Posters Session

5:30 – 7:00 pm
The Grove

The following works will be presented at the EI 2019 Symposium Interactive Papers Session.

IRIACV-465
Improved 3D scene modeling for image registration in change detection, *Sjors van Riel, Dennis van de Wouw, and Peter de With, Eindhoven University of Technology (the Netherlands)*

IRIACV-466
Single Shot Appearance Model (SSAM) for multi-target tracking, *Mohib Ullah and Faouzi Alaya Cheikh, Norwegian University of Science and Technology (Norway)*

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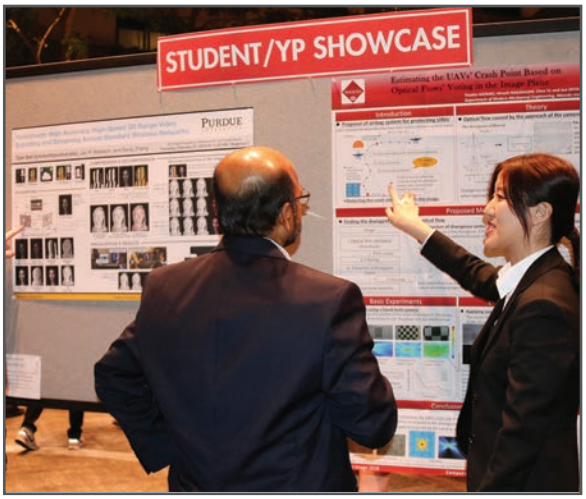

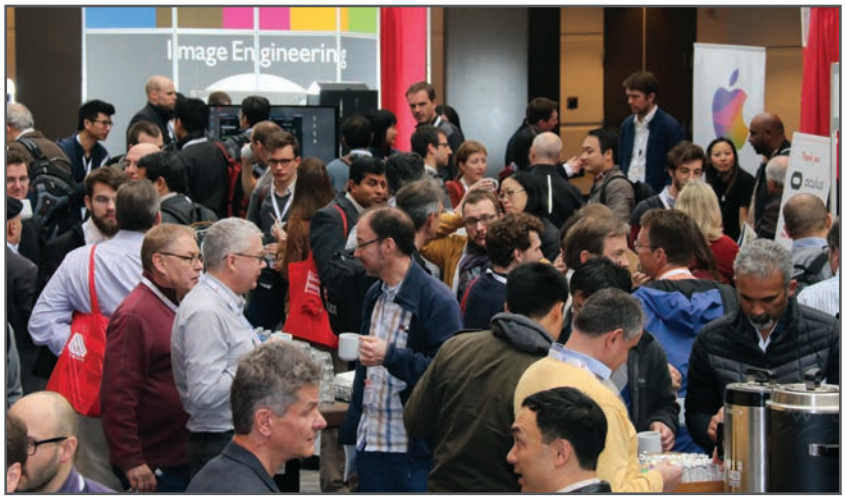

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