PROCEEDINGS

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Intelligent Robotics and Industrial Applications using Computer Vision 2020

Editors: **Henry Ngan**, ENPS Hong Kong (Hong Kong),
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IS&T International Symposium on Electronic Imaging 2020
Intelligent Robotics and Industrial Applications using Computer Vision

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Intelligent Robotics and Industrial Applications using Computer Vision 2020

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.

Award
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 Laboratory (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); **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); **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)

Paper authors listed as of 1 January 2020; refer to manuscript for final authors.
Titles that are not listed with the proceedings files were presentation-only.

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IS&T International Symposium on Electronic Imaging 2020
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INTELLIGENT ROBOTICS AND INDUSTRIAL APPLICATIONS USING COMPUTER VISION 2020

Monday, January 27, 2020

Robotics

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

8:45 – 10:10 am
Regency A

8:45
Conference Welcome

8:50   IRIACV-013
Passive infrared markers for indoor robotic positioning and navigation, *Jian Chen, AltVision, Inc. (United States)*

9:10   IRIACV-014
Improving multimodal localization through self-supervision, *Robert Relyea, Darshan Ramesh Bhanushali, Karan Manghi, Abhishek Vashist, Clark Hochgraf, Amlan Ganguly, Andres Kwasinski, Michael Kuhl, and Ray Ptucha, Rochester Institute of Technology (United States)*

9:30   IRIACV-015
Creation of a fusion image obtained in various electromagnetic ranges used in industrial robotic systems, *Evgeny Semenishchev[1] and Viacheslav Voronin[2]; [1]Moscow State Technical University (STANKIN) and [2]Don State Technical University (Russian Federation)*

9:50   IRIACV-016
Locating mechanical switches using RGB-D sensor mounted on a disaster response robot, *Takuya Kanda[1], Kazuya Miyakawa[1], Jeonghwang Hayashi[1], Jun Ohya[1], and Hiroyuki Ogata[2]; [1]Waseda University and [2]Seikei University (Japan)*

10:10 – 10:50 am Coffee Break

Machine Learning

Session Chairs: Kurt Niel, University of Applied Sciences Upper Austria (Austria) and Juha Röning, University of Oulu (Finland)

10:50 am – 12:30 pm
Regency A

10:50   IRIACV-048
A review and quantitative evaluation of small face detectors in deep learning, *Weihua Xionog, EagleSens Inc. (United States)*

11:10   IRIACV-049
Rare-class extraction using cascaded pretrained networks applied to crane classification, *Sander Klomp[1,2], Guido Brouwers[2], Rob Wijnhoven[2], and Peter de With[1]; [1]Eindhoven University of Technology and [2]ViNotion (the Netherlands)*

11:30   IRIACV-050
Detection and characterization of rumble strips in roadway video logs, *Deniz Aykac, Thomas Karnowski, Regina Ferrell, and James Goddard, Oak Ridge National Laboratory (United States)*

11:50   IRIACV-051
Real-time small-object change detection from ground vehicles using a Siamese convolutional neural network (JIST-first), *Sander Klomp, Dennis van de Wouw, and Peter de With, Eindhoven University of Technology (the Netherlands)*

12:10   IRIACV-052
Perceptual license plate super-resolution with CTC loss, *Zuzana Bilkova[1,2] and Michal Hradis[3]; [1]Charles University, [2]Institute of Information Theory and Automation, and [3]Brno University of Technology (Czechia)*

12:30 – 2:00 pm Lunch

PLENARY: Frontiers in Computational Imaging

Session Chairs: Radka Tezaur, Intel Corporation (United States), and Jonathan Phillips, Google Inc. (United States)

2:00 – 3:10 pm
Grand Peninsula Ballroom D

Imaging the Unseen: Taking the First Picture of a Black Hole, *Katie Bouman, assistant professor, Computing and Mathematical Sciences Department, California Institute of Technology (United States)*

For abstract and speaker biography, see page 7

3:10 – 3:30 pm Coffee Break

Computer Vision & Inspection

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

3:30 – 4:50 pm
Regency A

3:30   IRIACV-070
Estimating vehicle fuel economy from overhead camera imagery and application for traffic control, *Thomas Karnowski[1], Ryan Tokola[1], Sean Oesch[1], Matthew Eicholtz[2], Jeff Price[3], and Tim Gee[3]; [1]Oak Ridge National Laboratory, [2]Florida Southern College, and [3]GRIDSMART (United States)*

3:50   IRIACV-071
Tailored photometric stereo: Optimization of light source positions for different materials, *Christian Kapeller[1,2], Doris Antensteiner[1], Thomas Pinez[1], Nicole Brosch[1], and Svorad Štolc[1]; [1]AIT Austrian Institute of Technology GmbH and [2]Vienna University of Technology (Austria)*

4:10   IRIACV-072
Crowd congestion detection in videos, *Sultan Daud Khan[1], Habib Ullah[1], Mohib Ullah[2], and Faouzi Alaya Cheikh[2]; [1]University of Ha'il (Saudi Arabia) and [2]Norwegian University of Science and Technology (Norway)*

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4:30   IRIACV-074

Head-based tracking, *Mohib Ullah[1], Habib Ullah[2], Kashif Ahmad[3], Ali Shariq Imran[1], and Faouzi Alaya Cheikh[1]; [1]Norwegian University of Science and Technology (Norway), [2]University of Ha'il (Saudi Arabia), and [3]Hamad Bin Khalifa University (Qatar)*

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

Wednesday, January 29, 2020

10:00 am – 3:30 pm Industry Exhibition - Wednesday

10:10 – 11:00 am Coffee Break

12:30 – 2:00 pm Lunch

PLENARY: VR/AR Future Technology

Session Chairs: Radka Tezaur, Intel Corporation (United States), and Jonathan Phillips, Google Inc. (United States)

2:00 – 3:10 pm
Grand Peninsula Ballroom D

Quality Screen Time: Leveraging Computational Displays for Spatial Computing, *Douglas Lanman, director, Display Systems Research, Facebook Reality Labs (United States)*

For abstract and speaker biography, see page 7

3:10 – 3:30 pm Coffee Break

Intelligent Robotics and Industrial Applications using Computer Vision 2020 Interactive Papers Session

5:30 – 7:00 pm
Sequoia
The following works will be presented at the EI 2020 Symposium Interactive Papers Session.

IRIACV-325

An evaluation of embedded GPU systems for visual SLam algorithms,
Tao Peng, Dingnan Zhang, Don Nirmal, and John Loomis, University of Dayton (United States)

WITHDRAWN IRIACV-326

An evaluation of visual SLam methods on NVIDIA Jetson Systems,
Dingnan Zhang, Tao Peng, Don Nirmal, and John Loomis, University of Dayton (United States)

5:30 – 7:00 pm EI 2020 Symposium Interactive Posters Session

5:30 – 7:00 pm Meet the Future:
A Showcase of Student and Young Professionals Research

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